Chemicals and Application
of the
Proposed Action

Specialist Report

East Fork Boulder Creek Native Trout
Restoration Project
USDA-Forest Service-Dixie National Forest

Submitted by: /s/ Mike Golden

MIKE GOLDEN, FOREST FISHERIES BIOLOGIST
Dixie National Forest

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The following describes the chemicals and their application for the Proposed Action of the East Fork Boulder Creek Native Trout Restoration Project. All alternatives are described in Appendix 1; however, only the Proposed Action would use the chemicals that are described in this report. Chemicals are not used in the other alternatives.

Rotenone

Rotenone ({2R,6aS,12aS}-1,2,6,6a,12,12a-hexahydro-2-isopropenyl-8,9-dimethoxychromeno[3,4-b]furo[2,3-h]chromen-6-one) is a naturally occurring flavonoid derived from the roots of tropical plants in the pea and bean family (Leguminosae), including jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) found in Australia, Oceania, southern Asia, and South America (Finlayson et al., 2000). Rotenone is a non-specific botanical insecticide, acaricide, and piscicide and was historically used as a fishing method by indigenous tribes of South America and Malaysia. Roots containing the compound were ground up and the pulp applied to water bodies.

Rotenone interrupts aerobic cellular respiration by blocking electron transport in mitochondria through the inhibition of the enzyme NADH ubiquitone reductase, which prevents the availability of oxygen for cellular respiration. In other words, rotenone inhibits a biochemical process at the cellular level, making it impossible for fish to use the oxygen absorbed in the blood and needed for releasing of energy during respiration (Singer and Ramsay 1994, Finlayson et al. 2000). In effect, rotenone causes death through tissue anoxia by blocking oxygen uptake at the cellular level and not at the water/blood interface at the gills (Ling 2003). The lack of cellular oxygen availability initiates anaerobic respiration in turn leading to increased lactic acid concentrations and dropping blood pH levels (Fajt and Grizzle 1998).

Rotenone, its toxicity, its effects on the environment, and/or its potential effects on human health have been the subject of several reviews, analyses, and risk assessments over the past decade (Finlayson et al. 2000, Ling 2003, USEPA 2006, Entrix 2007, Turner et al. 2007, USEPA 2007, Durkin 2008). Many of these documents provide detailed discussions of various aspects of rotenone and its use. The following is a brief summary of available information on the composition of rotenone formulations, their toxicity, and how their use in the proposed action may affect fish in the project area and downstream.

Rotenone is highly toxic to fish and is ideal for the control of invasive or unwanted fish species. In the aquatic environment, rotenone is readily transmitted across the permeable membranes of the gills. Gills are highly evolved respiratory structures that maximize the uptake of oxygen (O_2) and excretion of carbon dioxide (CO_2) because of their large surface area, thin lamellar membrane, and efficient countercurrent exchange mechanism. Fish supplement this efficiency by actively ventilating water across the gills by controlled branchial pumping. These features make fish highly susceptible to low concentrations of rotenone. Variation in rotenone sensitivity exists between fish

species; however, rotenone tolerance generally varies inversely with oxygen requirements, as would be expected for a respiratory poison (Engstrom-Heg et al. 1978).

The U.S. Environmental Protection Agency (EPA) listed rotenone as "Very highly toxic" to aquatic organisms with a 96 hour LC50 concentration of less than 2 µg/l for rainbow trout (USEPA 2006, USEPA 2007). Ling (2003) reviewed rotenone toxicity information for a variety of fish species and showed that salmonids are generally very sensitive to rotenone with 24-hour LC50 concentrations of less than 6 µg/l. Similarly, Cheng and Farrell (2007) found that the 96-hour LC50 concentration for rotenone was 5.8 µg/l, but that the LC50 concentration increased slightly with increasing levels of dissolved organic carbon in the water. Finlayson et al. (2010) reported older studies that found 3, 6, and 24 hour LC50 concentrations of active ingredient rotenone of 8.8 µg/l, 4.4 µg/l, and 3.4 µg/l for rainbow trout using Noxfish 5% rotenone formulation. Finalyson et al (2010) also derived 4 hour and 8 hour LC50 concentrations of active ingredient rotenone for rainbow trout of 7.4 µg/l and 5.3 µg/l for CFT Legumine rotenone formulation and 7.7 µg/l and 6.2 µg/l for Nusyn Noxfish rotenone formulation. Rotenone toxicity to fish also varies with both water temperature and contact time increasing toxic effects (Ling 2003).

Potassium permanganate

Rotenone can be neutralized by potassium permanganate ($KMnO_4$), and this compound would be used at multiple locations where water leaves the project area under the proposed action. This inorganic chemical would be applied at the downstream boundary of the treatment area at the fish barriers, water exiting Garkane's upper power plant, and water exiting Garkane's main hydroplant into the hydroplant pond. Potential effects would extend downstream of the neutralization station up to a 30-minute travel time, approximately 0.25 to 0.5 miles. Potassium permanganate is a strong oxidizing agent used in many industries and laboratories. It is used as a disinfectant in treating potable water. In fisheries and aquaculture, potassium permanganate is used to treat some fish parasites. Under the Proposed Action, potassium permanganate would be used to neutralize rotenone (USEPA 2006, Ling 2003). Following rotenone application, potassium permanganate is applied to the treated water at a ratio between two and four parts potassium permanganate to each part of rotenone (USEPA 2006). Under the Proposed Action, the potassium permanganate concentration may range from 2 to 4 mg/L depending on the organic load in the receiving water at the time of treatment.

Manganese is the principal element in the permanganate solution with potential toxicity; however, manganese is also an essential nutrient for plants and animals, and specific signs of manganese deficiency include a wide range of symptoms including nervous system disorders, bone fragility, and growth suppression (Browning 1969). Manganese comprises about 0.1% of the earth's crust and is ubiquitous in the environment (rock,

soil, water). Potassium permanganate is produced by thermal oxidation of manganese dioxide (MnO_2) followed by electrolytic oxidation. The environmental chemistry and fate of manganese is controlled largely by pH. At pH values above 5.5 (approximately), colloidal manganese hydroxides generally form in water. Such colloidal forms are not generally bioavailable. As a strong oxidizing agent, permanganate is reduced when it oxidizes other substances (such as rotenone). Thus, in the process of oxidizing rotenone, potassium permanganate is in turn reduced, liberating bioavailable oxygen in the process. This mechanism counters rotenone's respiratory toxicity. In the process, potassium ions are liberated (also an essential electrolyte), and manganese dioxide is formed. Manganese dioxide is insoluble, hence not bioavailable, and chemically similar to the manganese dioxide found in the earth's crust (Vella 2006).

Potassium permanganate is toxic to gill-breathing organisms at the rate (2 to 6 mg/L) required for neutralization. The toxicity of potassium permanganate to fish ranges from 0.75 to 3.6 mg/L (96 hr LC50 values) and is about 1.8 mg/L for rainbow trout; however, recent studies showed rainbow trout treated with a 2mg/l potassium permanganate solution for 2 hours a day did not show increased mortality (Marking and Bills 1975, Oplinger and Wagner 2010). Potassium permanganate will neutralize rotenone in 15 to 30 minutes, depending on water temperature. Manganese oxide, formed during the oxidation of the rotenone, is a biologically inactive compound. In flowing water treatments, this balance usually limits aquatic exposure to permanganate and rotenone to 0.25 to 0.5 mile downstream of the neutralization site (Hobbs et al. 2006).
Because application of excess potassium permanganate could adversely affect downstream fish populations, UDWR would avoid and minimize any effects of potassium permanganate on fish populations.

Other chemicals

In addition to rotenone, liquid formulations of rotenone contain petroleum based products characterized as petroleum distillates, xylene range aromatics, or aromatic petroleum products, as well as "associated resins." The following is a brief discussion on these ingredients in terms of three common rotenone formulations available on the market today Chemfish Regular, manufactured by TIFA International LLC, as well as Prentox Prenfish Toxicant and CFT Legumine, both of which are manufactured by Prentiss Incorporated (Table 1; Appendix 2 contains Material Safety Data Sheets [MSDS] for each of these formulations). The MSDS's for the liquid formulations provide varying levels of detail in specifying the nature of the solvents used in the formulations. The MSDS for Prentox Prenfish Toxicant identifies many of the specific compounds in the petroleum products as well as the concentrations of the components in the solvent. Conversely, the MSDS's for CFT Legumine and Chemfish Regular simply refer to other ingredients as inert or an aromatic petroleum solvent.

Fisher (2007) analyzed several lots of CFT Legumine to determine their composition and found that the major constituents were rotenone (5.1%), rotenolone (.7%), Methyl

Pyrrolidone(9.8%), DEGEE (61.1%; diethylene glycol monoethyl ether), and Fennedefo 99 (17.1%). Sixteen additional constituents were found in the formulations (Fisher 2007; summarized in Table 2 below).

Table 1. Composition (percent by weight) of liquid rotenone formulations based on Material Safety Data Sheets (MSDS).

Formulation	Rotenone	Other/cube resins	Other ingredients
Prentox Prenfish	5%	10%	85% - Aromatic petroleum solvent[a]
CFT Legumine	5%	5%	90% Inert Ingredients, Including N-90 Methylpyrrolidone
Chemfish	5%	5%	90% Aromatic petroleum solvent

[a] Identifies naphthalene (9.9%), 1,2,4-trimethylbenzene (1.7%), acetone, and two unnamed emulsifiers.

Chemfish Regular lists an aromatic solvent and other associated resins in its formulation (Chemfish Regular MSDS, Appendix 2). TIFA International LLC released the solvent and two potential emulsifiers used in formulations of Chemfish Regular (Cerciello 2010). The solvent is Aromatic 200 manufactured by Exxon and the emulsifiers a T-Mulz O and T-Mulz-W (see Appendix 2 for MSDS). The MSDS for Aromatic 200 lists the compound as "Solvent naphtha (petroleum), heavy 64742-94-5 100% aromatic." Additionally, the MSDS states that the product consists predominantly of C9-C15 aromatic hydrocarbons, primarily C10-C12, and contains approximately 14% naphthalene by weight. It lists an acute oral LD50 (rat) greater than 3 g/kg of body weight and an acute dermal LD50 (rabbit) greater than 3 g/kg of body weight.

T-Mulz O and T-Mulz-W are listed as "Organic mixtures" on the MSDS (Appendix 2). The MSDS lists n-Butyl Alcohol 1-Butanol (10% maximum) and C (11-13) Branched Alkyl Benzene Sulfonic Acid, Calcium Salts (20% maximum) as potential hazardous components in T-Mulz O. Hazardous components in T-Mulz W include up to 10% Naphtha, Light Aromatic - Aromatic Hydrocarbons C8-10 (up to 3.2 % of this is 1,2,4-Trimethylbenzene Pseudocumene), up to 10% n-Butyl Alcohol 1-Butanol, and up to 25% Branched Alkyl Benzene Sulfonic Acid, Calcium Salts.

Table 2. Average concentrations of other constituents identified CFT Legimine formulations analyzed by Fisher (2007).

Constituent	Average concentration in undiluted CFT Legumine formulation (mg/l)
1,2,4,5-tetramethylbenzene	369
1,4-diethylbenzene	453
total c4 substituted benzenes	2,586
total c5 substituted benzenes	796
1-Hexanol	3,600
tri(ethylene glycol)	266
tetra(ethylene glycol)	1,194
penta(ethylene glycol)	2,471
hexa(ethylene glycol)	4,386
Trichloroethylene	7.3
Toluene	166.7
Tetrachloroethylene	12.8
Xylene-m/p	2.9
Trimethylbenzene, 1,2,4	30.7
Butylbenzene , n-	23.6
Naphthalene	255.1

Rotenone is obtained by processing the roots of plants such as *Derris* and *Lonchocarpus* species. Consequently, the materials from which rotenone formulations are made consist of complex mixtures of rotenone and other plant materials commonly referred to on the product labels as other associated resins or other associated extracts. Most of the constituents of the associated resins do not appear to be biologically active. A notable exception, however, is deguelin, which appears to be about half as toxic as rotenone (Cabizza et al. 2004) and is present in cube resin at a concentration of about 22%, about half the concentration of rotenone (Fang and Casida 1999). Other agents in cube resin are less toxic than deguelin by at least a factor of 2 (Fang and Casida 1999).

The processing of roots from *Derris* and *Lonchocarpus* species to obtain cube resins, which constitute the non-end use formulations of rotenone, can involve the use of trichloroethylene, which when present in rotenone formulations is considered as a

contaminant or impurity. The concentrations of trichloroethylene in rotenone end-use formulations are very low. Fisher (2007) reports that trichloroethylene was found in samples of CFT Legumine at concentrations of 7.3 (0-29.1) mg/L, i.e. about 0.00073% (0% - 0.0029%), and that the estimated concentration in a lake after the application of CFT Legumine is 0.0073 µg/L (about 7.3 parts per trillion). Finlayson et al. (2000) indicates that initial water concentrations of trichloroethylene could reach 1.4 ppb (1.4 µg/L) in water after an application of rotenone at a concentration of 2000 ppb, i.e., a factor of 10 greater than the maximum allowable application rate.

As part of the re-registration process USEPA (2006) conducted a review of the available toxicity data on all formulated products of rotenone and the formulation ingredients typically evaluated; however, only limited toxicity data were available on the inert ingredients. The evaluation of both technical grade rotenone (>95% active ingredient) and formulated end-product determined that the technical grade active ingredient is generally more toxic than formulated end-product [corrected for active ingredient] by at least a factor of 2 (USEPA 2006). These data suggest that for the formulated products tested and the toxicity endpoints measured, the dispersant ingredients do not contribute substantially to the toxicity of the active ingredient and are effectively inert. Similarly, Durkin (2008) presented data indicating that that the toxicity of the formulations is generally less than or equal to the toxicity of rotenone itself. Finlayson et al. (2001) indicated that in flowing water persistence of rotenone, its metabolites, and volatile and semi-volatile other ingredients are limited in duration. Therefore, toxicity to fish from the rotenone formulations is not expected to be different from the toxicity of the active ingredient rotenone in the formulation.

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Appendix 1. Project Area and Alternatives Analyzed in Detail

The following describes and compares the Forest Service alternatives analyzed. It includes a description of the UDWR's proposed project and considers UDWR's treatment alternative in detail. This section also presents the alternatives and the UDWR activities that would be authorized or connected actions to the alternatives in comparative form.

Project Area

The proposed East Fork Boulder Creek Native Trout Restoration Project (project) is located approximately 7 miles northwest of Boulder, Utah (see Figure 1). The total treatment area is as follows:

- approximately 7.8 miles (12.6 km) of East Fork Boulder Creek from the natural barrier (below headwater meadow) on East Fork Boulder Creek to its confluence with West Fork Boulder Creek;

- approximately 0.2 miles (0.4 km) of lower West Fork Boulder Creek, from a previously constructed barrier to its confluence with East Fork Boulder Creek;

- approximately 0.5 miles (0.8 km) of Boulder Creek from the confluence of East Fork Boulder Creek and West Fork Boulder Creek downstream to a previously constructed fish barrier;

- all seeps and springs flowing into those sections of streams proposed for fish removal; and

- the Garkane Energy water transfer pipeline between the West Fork Reservoir and King's Pasture Reservoir; King's Pasture (East Fork) Reservoir; a pond on private property in King's Pasture, and the Garkane Energy penstock, between King's Pasture Reservoir and the Garkane Energy Boulder Creek Hydroelectric Power Plant (main power plant).

The treatment stream reaches flow through portions of Sections 27, 28, 33, and 34 of T31S, R4E, and Sections 3, 10, 15, 21, 22, and 28 of T32S, R4E, Salt Lake Baseline Meridian. Treatment would include connecting waters, including relatively large inflows or tributaries with permanent fish habitat and smaller springs and seeps that are capable of at least temporarily holding small fish. Known tributaries and inflows vary in length from 10 meters to over 750 meters.

The reaches on NFS-lands are all on the Escalante Ranger District of the Forest in Garfield County, Utah. The inflow of the water transfer pipeline is at the West Fork Reservoir in Section 8, T32S, R4E, and the outflow is at King's Pasture Reservoir in Section 10 of T32S, R4E. The inflow of the penstock is at King's Pasture Reservoir, and the outflow is at the main power plant in Section 35 of T32S, R4E.

No Action- No Further Treatment Scenario

Under the No Action alternative, the Forest would not approve the pesticide use permit to UDWR, would not authorize UDWR to use motorized vehicles off of designated routes for the application of rotenone to waters of the treatment area on NFS lands, and would not approve a special use authorization for UDWR to bury removed fish.

The No Action alternative would not preclude UDWR from implementing actions on NFS lands that would meet the purpose and need for UDWR's project but do not require Forest Service authorization. This includes UDWR activities described under the Non-chemical Treatment alternative (Section 2.1.3) except for the use motorized vehicles off of designated routes or burial of removed fish on NFS lands. The No Action alternative would also not preclude UDWR from implementing actions on non-NFS lands that are related to the purpose and need for UDWR's project but not under Forest Service jurisdiction or authorization.

One possible option for UDWR is to take no further action to meet the purpose and need of the proposed project. This possible option is identified in this analysis as the "No Action - No Further Treatment Scenario" and is the basis for the effects analysis for the No Action alternative to provide the base line for comparison of expected future conditions if neither the Proposed Action nor Non-chemical Treatment alternative were implemented by the Forest and UDWR were to take no further action to meet the purpose and need.

Proposed Action

The Proposed Action is to approve the pesticide use permit that the Forest Service requires the UDWR to have to apply the fish toxicant rotenone to waters that flow on NFS lands and to authorize motorized vehicle use off of designated routes. The pesticide use permit would authorize the UDWR to implement a maximum of three treatments on NFS land, one treatment per year for three consecutive years. Waters on NFS land that would be treated by UDWR under the Forest Service pesticide use permit are as follows:

- approximately 7.8 miles (12.6 km) of East Fork Boulder Creek from the natural barrier (below headwater meadow) on East Fork Boulder Creek to its confluence with West Fork Boulder Creek;

- approximately 0.2 miles (0.4 km) of lower West Fork Boulder Creek, from a previously constructed barrier to its confluence with East Fork Boulder Creek;

- approximately 0.5 miles (0.8 km) of Boulder Creek from the confluence of East Fork Boulder Creek and West Fork Boulder Creek downstream to a previously constructed fish barrier; and

- all seeps and springs flowing into those sections of the stream reaches specified in the permit.

The UDWR activities that would be authorized by the Forest under the Proposed Action would completely eradicate non-native trout from East Fork Boulder Creek, a short segment of Boulder Creek, and a very short segment of West Fork Boulder Creek. All fish would be temporarily eliminated by UDWR from target waters. Use of motorized vehicles by UDWR off of designated routes may be needed to facilitate placement of equipment, especially neutralization equipment, in effective locations.

Several actions that are not part of the Forest Service decision are connected to the UDWR project, as follows. UDWR is proposing chemical treatment of connected waters on private property to meet the purpose of the UDWR project. Following fish removal, UDWR would introduce the CRCT into the treated stream segments to establish self-sustaining populations. Sterile hybrids of species of non-native trout may also be stocked by UDWR at some locations following the treatments to provide sport fishing

opportunities while native trout become established. The following describes the UDWR project in detail, including identification of those actions that do not require Forest Service authorization.

Chemicals. Liquid emulsifiable rotenone (Liquid Rotenone, 5% Active Ingredient, EPA Registration No. 432-172) would be used by UDWR to treat target waters. Rotenone was selected as the chemical to use because of its effectiveness in controlling fish populations and its lack of long-term effects on the environment (Sousa et al 1987). When used at the concentrations planned for the UDWR project, rotenone is a naturally occurring fish toxicant that is toxic to only fish, some aquatic invertebrates, and some juvenile amphibians. EPA found it to be not toxic to humans, other mammals, and birds at the concentrations used to remove fish (EPA 2007). It has been widely used in the United States since the 1950's. UDWR has used rotenone successfully in many similar projects and has refined application techniques to minimize adverse side effects to the environment (Hepworth et al. 2001a, Hepworth et al. 2001b, Hepworth et al. 2001c, Ottenbacher and Hepworth 2001, Chamberlain and Hepworth 2002a, Chamberlain and Hepworth 2002b, Chamberlain and Hepworth 2002c, Fridell et al. 2004, Fridell et al. 2005, Fridell and Rehm 2006).

Potassium permanganate would be used by UDWR to neutralize the rotenone at suitable locations to prevent the movement of rotenone into non-target waters. Potassium permanganate was selected, because it is a strong oxidizer that breaks down into potassium, manganese, and water. All are common in nature and have no deleterious environmental effects at the concentrations that would be used for the UDWR project activities, including those that would be authorized by the Forest under the Proposed Action (Finlayson et al. 2000). Potassium permanganate is used as an oxidizing agent in treatment plants to purify drinking water (EPA 1999). Although the oxidation process is not immediate, neutralization should occur within an estimated 0.25 to 0.5 miles of the neutralization site.

A more detailed description of the chemicals that would be used for the UDWR project activities, including those that would be authorized by the Forest under the Proposed Action, can be found in specialist report on Chemicals and Application of the Proposed Action.

Application. Liquid rotenone would be applied by UDWR at a rate of 0.5 to 2.0 ppm. In the pond and reservoir, liquid rotenone would be dispersed from personnel on small water-craft using pressurized backpack spray units. For flowing waters, seeps, and springs, liquid rotenone would be applied using a combination of 30 gallon and 5 gallon dispensers with constant flow drip-heads at approximately 50 to 60 stations throughout the UDWR project area over a 3 to 24 hour period (Finlayson et. al 2000, Ottenbacher et al. 2009). One 30 gallon drip station would be used by UDWR at each at the following:

- lower end of the headwater meadow at the upstream end of the UDWR project area,
- approximately halfway between the headwater meadow and King's Pasture Reservoir,
- immediately below King's Pasture Reservoir, and
- at the intake for the water flow pipeline between the West Fork Reservoir and King's Pasture Reservoir.

Five-gallon drip stations would be located by UDWR at approximately 1 mile intervals, beginning one mile below King's Pasture Reservoir and ending 1 mile upstream from the fish barriers on the main stem of East Fork Boulder Creek, and at all major springs and seeps within the UDWR project area. The

interval placement of drip stations on the main stem of East Fork Boulder Creek would be to facilitate efficient travel time of chemicals. Depending on flow volume, a single 30 gallon or 5 gallon drip would be placed by UDWR on the lower fish barrier on West Fork Boulder Creek. Pressurized backpack sprayers would be used by UDWR to apply a diluted solution of the chemical to springs and backwater areas containing fish that were not effectively treated by boat or drip station.

Rotenone would be neutralized by UDWR with potassium permanganate downstream from target waters. Three sites are planned: where the penstock water is released at the upper power plant, where water is released at the main power plant, and at the fish barrier at the lower end of the treatment area. Each site would have a main neutralization station and at least one contingency neutralization station to ensure effectiveness. The neutralization stations would prevent rotenone from escaping the target area, except for the estimated 0.25 to 0.5 miles downstream in which the neutralization or natural degradation of rotenone would be occurring.

Post-treatment activity. Following confirmation of complete non-native trout removal, UDWR would reintroduce CRCT into project stream reaches from "core" CRCT populations or from fish produced by UDWR CRCT brood stocks. Sterile hybrids of species of non-native trout may also be stocked by UDWR at some locations following the treatments to provide sport fishing opportunities while native trout become established. All UDWR transfers or stocking of fish would comply with Utah Department of Agriculture and Food rules and UDWR policies.

Design Criteria. The following design criteria would be implemented and included in the Forest Service authorizations:

1. Stream sections will be treated in the fall to minimize impacts on non-target wildlife species (amphibians, insectivorous birds and bats). The fall treatment period will also minimize the impacts on sport fishing recreation.

2. Each treatment will be preceded by internal and external notifications and media releases to notify the public of treatment sites and dates and will include the following: notification of the Boulder Town Council, notification of private landowners in the treatment area, and news releases in local papers.

3. The treatment area will be placarded to prohibit public access during treatment and for at least 3 days following treatment.

4. Application of the chemical will be conducted by licensed pesticide applicators in accordance with all applicable regulations and policies.

5. Access by motorized vehicles will be on National Forest System roads designated for motorized vehicle use to the extent possible. Any use of motorized vehicles off of designated routes will be minimal and will require written Forest Service approval.

6. Neutralization sites will be placed to maximize their effectiveness at preventing downstream escapement of rotenone.

7. Treated waters will remain open to fishing.

8. Transport to the site and storage of chemicals on the site will comply with FSH 2109.14.40 (Pesticide-Use Management and Coordination Handbook, Chapter 40 - Storage, Transportation, and Disposal).

9. Sentinel fish ("in situ bioassay") will be used for pesticide residues monitoring to determine the presence or absence of unacceptable environmental effects.

10. Treatments will be discontinued if the objective of complete removal of non-native trout from the project area has been met.

Actions connected to but not included in the decision. The following parts of the UDWR project, as described above, are not subject to Forest Service permit requirements, and therefore are not included in the Forest Service decision. Selection of the Proposed Action is for issuance of the pesticide use permit for the application of rotenone on NFS lands only. The following, however, are considered connected actions and thus included in the environmental analysis:

1. The proposed UDWR treatment area includes private property, including property owned by Garkane Energy; thus, this area is not under Forest Service jurisdiction. This includes approximately 1.4 miles of East Fork Boulder Creek, Kings Pasture Reservoir, and the pond in Kings Pasture. To meet the purpose and need of the UDWR project, these areas as well as the water in the transmission pipeline and penstock must be treated by UDWR. Forest Service approval of the pesticide use permit for UDWR to apply rotenone to waters on NFS land is not approval of UDWR activities on non-NFS lands; however, the Forest Service would not approve the pesticide use permit unless UDWR is able to complete its project by treating waters off of NFS land.

   The expectation is that the entire UDWR project treatment area would receive chemical treatment as described below, although the UDWR may decide to use another method or methods to achieve the treatment objective. FERC license order Section 4(e), item 16, condition 4, requires Garkane Energy to use its reasonable efforts to cooperate in the work of UDWR and other agencies to remove non-native fish and re-establish CRCT in the above stream sections. This cooperation has already been demonstrated through construction of the fish barriers and through the first chemical treatment of Kings Pasture Reservoir in 2009.

2. Stocking of fish is under the jurisdiction of UDWR; thus, the CRCT stocking is not under Forest Service jurisdiction. To meet the purpose and need of the UDWR project, the stream would need to be stocked by UDWR with CRCT from core populations or UDWR brood stock post-treatment.

   The expectation is that the post-treatment recolonization/stocking of CRCT would occur as described. The purpose and need for the UDWR project, including stocking with CRCT, is to implement conservation actions under the CRCT Conservation Agreement and Strategy, to which UDWR is a signatory. In addition, the Forest Service conditions regarding the non-native fish eradication and fish restocking were included in a 2006 settlement agreement relating to the FERC license conditions and signed by Garkane Energy, Forest Service, and UDWR.

3. Fishing regulations, including whether or not treated waters would remain open to fishing, is under the jurisdiction of UDWR.

The expectation is that UDWR would manage the fishing regulations to meet the conservation actions under the CRCT Conservation Agreement and Strategy. UDWR recognizes the importance of the area to recreation users. Because of this, UDWR may also stock sterile hybrids of species of non-native trout at some locations following the treatments while native trout become established.

Non-chemical Treatment Alternative

Under the Non-chemical Treatment alternative, the Forest Service would authorize UDWR to use motorized vehicles off of designated routes and approve a special use authorization for UDWR to bury fish that are removed as necessary to implement a non-chemical treatment to remove non-native trout from waters on NFS land.

The non-chemical treatment methods would not involve the use of rotenone or other pesticides on NFS lands and, therefore, would not require Forest Service approval. The effects of the non-chemical treatment are being analyzed, because this option may be exercised by UDWR in the event that the Forest Service were to choose not to authorize pesticide use, and the approach would be a connected action to the authorization of the use of motorized vehicles off of designated routes and approval of a special use authorization for burial of removed fish. The other connected actions that would also not require new Forest Service action are described below. UDWR's non-chemical treatment and other connected actions may or may not occur under the No Action alternative if the UDWR were to use motorized vehicles only on designated routes. These UDWR actions also may or may not occur under the Proposed Action.

Under the Non-chemical Treatment alternative, UDWR would use electrofishing to remove non-native trout from the treatment waters on NFS lands. Except for possible motorized vehicle use off of designated routes and burial of removed fish, this alternative would not require Forest Service authorization.

Treatment area. The treatment area would remain the same as described in the Proposed Action.

Methodology and Equipment. Electrofishing would be used by UDWR to remove non-native trout from the treatment area on NFS lands. Electrofishing introduces an electric current into the water and is commonly used as a fish removal method. The electricity causes an involuntary muscle contraction in the fish, attracting them toward the source of the electricity (electrode). Workers with long-handled nets then collect the stunned fish. Voltage, amperage, pulse frequency, and waveform are manipulated to maximize effectiveness, which can be influenced by water flow and velocity, temperature, clarity, conductivity (dissolved mineral content), and substrate. Other factors influencing effectiveness include the fish size, species and behavior, presence of aquatic vegetation, time of year, and time of day. It is most effective in shallow water and is, therefore, most commonly used in rivers and streams and occasionally in the shallow water zones of lakes.

Electrofishing removal would be accomplished by UDWR using multiple Smith-Root LR24 backpack electrofishing units or their equivalent from another manufacturer. Block nets of sufficient width would be set up to prevent fish emigration during removal activities. Dip nets, buckets, and live wells would also be necessary for capture and removal of brook trout (*Salvenlinus fontinalis*) and capture and safe holding of CRCT.

Removal activities. Mechanical removal of non-native trout species using backpack electrofishing has been attempted in several other projects (Moore et al. 1986, Meronek et al. 1996, Thompson and Rahel 1996, Buktenica et al. 2000, Kulp and Moore 2000, Shepard et al. 2002, Peterson et al. 2004, Moore et al. 2005, Meyer et al. 2006, Earle et al. 2007). The results of these prior mechanical removal projects indicate: 1) achieving complete mechanical removal of trout in streams with the width, complexity, and number of small, heavily vegetated springs/tributaries found in East Fork Boulder Creek would be difficult; 2) success would be enhanced by implementing multiple-pass depletion removal efforts 3 to 4 times within the same year, and 3) success would be enhanced by treatment over multiple years (minimum of 2). For this UDWR project, the multi-year removal effort would involve a minimum of 5 to 6 people conducting multiple-pass removal efforts for the majority of summer and early autumn (late June to September) over a period of several years. While such removal efforts would undoubtedly cause major reductions in brook trout density and biomass, they may or may not result in complete eradication. UDWR would begin CRCT reintroduction efforts only when no brook trout are found within the project area.

The electrofishing removal by UDWR would follow the population monitoring methods used by Utah State University's Institute for Natural Systems Engineering, Utah Water Research Lab (INSE) during their Garkane-funded fish population monitoring on the Boulder Creek system (Hardy et al. 2009a, Hardy et al. 2009b). Personnel would electrofish approximately 100-meter reaches in 8.5 miles of the mainstem of East Fork Boulder Creek, West Fork Boulder Creek, and Boulder Creek along with all spring inflows and tributary streams. A block net would be placed across the upstream and downstream end of each reach to increase capture efficiency by preventing emigration. Up to 4 passes, or until no fish were collected, would be completed through each reach. Each pass would involve all personnel walking in the stream channel and on the banks while applying constant electric current to the water from at least two backpack electrofishers. All organisms within the stream would be subjected to the electric field. All non-native brook trout would be removed from the system, killed and buried. Any CRCT collected would be held in buckets/live wells and returned to the stream after completion of the 4 pass removal.

Effort. One crew would consist of at least 2 personnel using backpack electrofishers, 2 netters retrieving stunned fish, and 1 person with a bucket receiving and disposing of fish. Electrofishing batteries would be recharged using small gasoline powered generators. Based on their previous monitoring efforts, INSE estimated that in a 40 hour work week, 9 sites that were each 100 m long could be completed by a 5 to 6 person crew using the four pass methodology (C. Williams, Institute for Natural Systems Engineering, personal communication with M. Golden, Dixie National Forest, 3/12/2010). Based on this INSE estimate, for UDWR fish removal activities under the Non-chemical Treatment alternative, one removal effort on the 11.5 km mainstem stream (12.8 reaches, 900 m long) on NFS land would require approximately 512 hours (12.8 reaches times 40 hours) or 63 days (8 hours per day) to be completed by a 5 to 6 person crew using the four pass method. An additional effort of approximately 13 days would be needed to treat the 2.3 km mainstem on private property.

Because UDWR's removal activities would need to occur between late-June or early July and September to minimize access, weather, and high stream flow issues, each removal effort would be limited to approximately 20 days to be able to conduct 4 removal efforts in a single year. To be able to treat the entire mainstem stream, on NFS lands and private lands, during any one removal effort, 20 people (four 5-person crews) would be needed. For four removal efforts, this would total up to 80 days per year. As described below, UDWR may need up to 10 years of removal effort under this method.

During the UDWR's 2009 chemical treatment of East Fork Boulder Creek above King's Pasture Reservoir, 23 relatively large inflows or tributaries with permanent fish habitat were identified, along with many smaller springs and seeps capable of at least temporarily holding small fish. These tributaries and inflows varied in length from 10 m to over 750 meters. Additional inflows and tributaries that contain fish habitat are probably present in the reach below Kings Pasture and could add another 30 days or more to the estimated treatment time.

Efficiency of fish removal by electrofishing is substantially lower in certain types of habitats found in the treatment area, especially those with heavy aquatic vegetation, root wads, woody debris, and boulder fields. The time for one removal effort in these types of areas could be higher, and effectiveness could be lower. Also, in order to eliminate the possibility of fish moving between treated and untreated reaches, crews would need to operate simultaneously, which may negatively impact fish-removal efficiency, as stream bed disturbance from upstream crews would impact water clarity and visibility for downstream crews. Because of reduced removal efficiency with electrofishing as the fish removal method, the UDWR project may extend to 10 years.

Post-Fish Removal activities. Post-fish-removal activities by UDWR would be the same as those described for the Proposed Action.

Design Criteria. The following design criteria would be included in the written authorization for use of motorized vehicles off of designated routes and the special use authorization for the burial of removed fish:

1. State of Utah decontamination protocols for prevention of the spread of Aquatic Nuisance Species will be followed for all gear and personnel involved with the removal project.

2. The Forest Archaeologist will be consulted about potential locations to bury fish to avoid impacts to cultural resources.

3. Dead fish collected will be buried no closer than 300 feet from the stream and away from known camping areas to minimize bear/human interactions.

4. Access by motorized vehicles will be on National Forest System roads designated for motorized vehicle use to the extent possible. Any use of motorized vehicles off of designated routes will be minimal, and will require written Forest Service approval.

5. Trails will be used whenever possible to move from one location to another to minimize soil and vegetation disturbance and to prevent establishing new trails.

6. Sensitive plant habitat will be avoided during action implementation.

7. Personnel will ensure reach being treated is void of livestock and people not involved with the operation. Treated waters will remain open to fishing.

Actions connected to fish removal actions on NFS lands. The following parts of the UDWR project, as discussed above, are not subject to Forest Service permit requirements, and therefore are not included in the Forest Service decision. They are considered connected actions to UDWR's fish removal activities on NFS lands and thus included in the environmental analysis:

1. As described for the Proposed Action, the UDWR treatment area includes private property, including that owned by Garkane Energy; thus, this area is not under Forest Service jurisdiction.

   The expectation is that under the Non-Chemical Treatment alternative, the UDWR would implement non-chemical treatment methods on non-NFS lands, as described below, although the UDWR may decide to use another method or methods to achieve the treatment objective on the private lands or not pursue treatment on the private lands. The flowing portions of the project area on private lands would undergo similar electrofishing removal by UDWR, as described for NFS lands above.

   For the non-flowing portions of the project area on private lands, electrofishing would not be effective in removing brook trout from King's Pasture Reservoir or the pond in Kings Pasture. To remove brook trout from these areas without use of chemicals, UDWR would deploy experimental gill nets with many different mesh sizes at several locations and depths throughout each water body. Other studies where this method has been successful at eradicating brook trout suggest that it would take at least two and up to four seasons of semi-continuous netting to eliminate all size classes of trout from small lakes with relatively low trout densities (Knapp and Matthews 1998, Parker et al. 2001).

2. Potential recolonization from East Fork Boulder Creek would severely reduce the efficacy of removing brook trout from King's Pasture Reservoir; therefore, UDWR would need to construct a fish migration barrier in East Fork Boulder Creek on private property above King's Pasture Reservoir.

   The barrier would generally consist of a small check dam constructed of boulders and large rocks, creating a vertical drop of approximately 5 ft on the downstream side. The location for the barrier would be selected by UDWR to utilize any naturally occurring drops which can be enhanced and where the stream channel and floodplain are confined to minimize the size of the structure and the amount of water impounded behind it. Barrier construction would comply with laws, regulations, and permitting requirements of the State Engineer for stream channel alteration. Barrier materials would be taken from the ground surface, near the stream. The collection of these materials would not require excavation, stream alteration, or vegetation disturbance. If sufficient material is not available on site, additional materials would be hauled to the barrier site from an approved source.

   The barrier location would be selected by UDWR to minimize changes in stream gradient, hydraulic function, and water pooling. In addition, the barrier would be constructed by UDWR adjacent to existing roads where equipment access is acceptable, thus requiring little disturbance to surrounding areas. Riparian vegetation would be disturbed as little as possible during the construction of the barrier, while areas where surface disturbance would occur would be restored to pre-project conditions. The barrier would not be placed in areas of cultural or historic significance or in areas where sensitive, threatened or endangered plants occur. It would be designed to operate under the natural fluctuations of a stream flow without routine maintenance. The barrier would be designed to pose little, if any, threat to the natural stream system or its associated riparian area so that if it were to fail, no damage would result to the stream environment. UDWR's maintenance could include

the adjustment or replacement of individual rock materials, but such work would be minor. The barrier could be removed but only after treatment is determined to be fully successful.

Neither netting nor electrofishing are options for UDWR for removing any non-native trout that may be using the upper portion of the penstock inflow or the lower portion of the pipeline from the West Fork Reservoir during treatment efforts. Shutting off water to these areas until they were completely dry would be the only way to ensure complete eradication; however, this is not feasible (M. Avant, Garkane Energy, personal communication with M. Golden, Dixie National Forest, 4/1/2010). Because of this, the effectiveness of the rest of the treatment would be reduced, contributing to the likelihood of the longer period of treatment.

3. Stocking of fish by UDWR would be as described for the Proposed Action.

4. As described for the Proposed Action, fishing regulations, including whether or not treated waters would remain open to fishing, is under the jurisdiction of UDWR. The expectation is as described for the Proposed Action.

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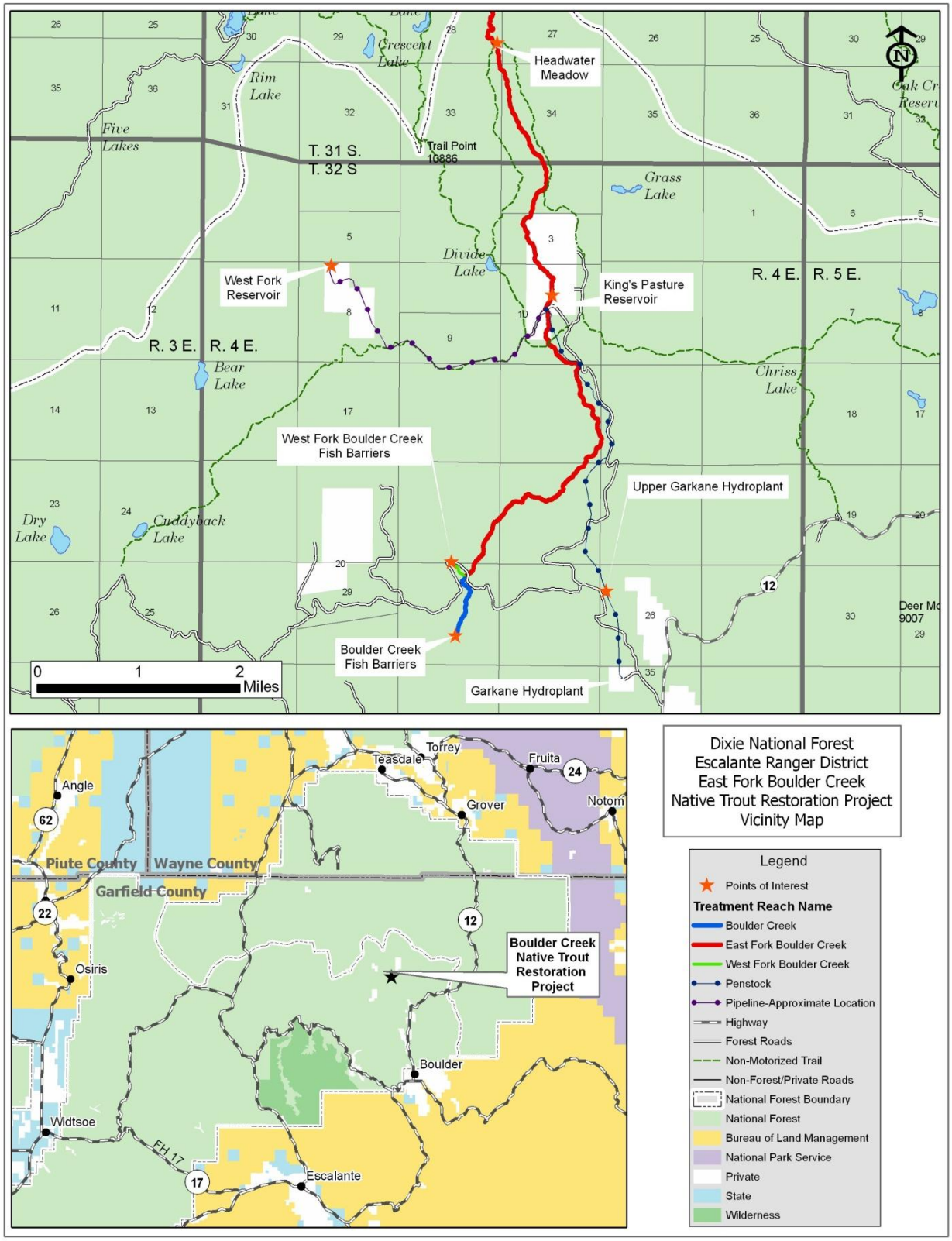
Figure 1. Project area location



Appendix 2. Material Safety Data Sheets

Material Safety Data Sheet

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT/CHEMICAL NAME: CFT Legumine™

Emergency Contact: 1-800-858-7378 (National Pesticide Information Center)

Transportation Emergency Contact: 1-800-858-7378 (National Pesticide Information Center

Manufactured for: CWE Properties Ltd., LLC
P.O. Box 336277
Greeley, CO 80633

SECTION 2: HAZARDS IDENTIFICATION SUMMARY

KEEP OUT OF REACH OF CHILDREN –WARNING – May be fatal if inhaled. May be fatal if swallowed. Causes substantial, but temporary, eye injury. Causes skin irritation. Do not breathe spray mist. Do not get in eyes, on skin, or on clothing. Wear goggles or safety glasses. This product is an orange, viscous liquid with slight petroleum odor.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Ingredients:	Percentage By Weight	CAS No.	TLV (Units)
Rotenone	5.00	83-79-4	5 mg/m$_3$
Other Associated Resins	5.00		
Inert Ingredients, Including N-Methylpyrrolidone	90.00	872-50-4	not listed

SECTION 4: FIRST AID MEASURES

IF SWALLOWED: Call a physician, Poison Control Center, or the National Pesticide Information Center at 1-900-858-7378 immediately for treatment advice. Do not induce vomiting unless told to do so by the Poison Control Center or physician. Do not give any liquid to the person. Do not give anything by mouth to an unconscious or convulsing person.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably by mouth-to-mouth. Call a physician, Poison Control Center, or the National Pesticide Information

Center at 1-800-858-7378 immediately for treatment advice.

IF IN EYES: Hold eyelids open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician, Poison Control Center, or the National Pesticide Information Center at 1-800-858-7378 immediately for treatment advice.

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin with plenty of water for 15-20 minutes. Call a physician, Poison Control Center, or the National Pesticide Information Center at 1-800-858-7378 immediately for treatment advice.

Note: Have the product container or label with you when obtaining treatment advice.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point (Method Used): 192°F (89°C) (Closed Cup)

Flammable Limits: LFL: Not established
UFL: Not established

Extinguishing Media: CO_2, foam, dry chemical water spray.

Special Fire Fighting Procedures: Use self-contained breathing apparatus and full protective equipment. Fight fire from upwind from a safe distance and keep non-essential personnel out of area.

SECTION 6: ACCIDENTAL RELEASE MEASURES

SPILL/LEAK PROCEDURES: Wear protective clothing as described in Section 8 (Exposure Controls / Personal Protection) of this MSDS. Absorb liquid with material such as clay, sand, sawdust, or dirt. Sweep up and place in a suitable container for disposal and label the contents. Area can be washed down with a suitable solution of bleach or soda ash and an appropriate alcohol (methanol, ethanol, or isopropanol). Follow this by washing with a strong soap and water solution. Absorb any excess liquid as indicated above, and add to the disposal container. This product is extremely toxic to fish. Fish kills are expected at recommended use rates. Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

SECTION 7: HANDLING AND STORAGE

HANDLING: Avoid inhalation of vapors. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with skin. Wear clean protective clothing. Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

STORAGE: Store in original containers only. Store in a dry place away from children and domestic animals. Do not store at temperatures below 40 F/4.4^{O}C. This product is stable for a minimum of 1 year when stored in sealed drums at 70^{O}F/21.1 $_{o}$C. Do not contaminate water, food or feed by storage or disposal.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHS PELs (see section 3).
RESPIRATORY PROTECTION: When working with an undiluted product in a confined space, use a non-powered air purifying respirator equipped with an N–, R-, or P-series filter. For emergency or non-routine operations (cleaning reactor vessels or storage tanks), wear an SCBA"

Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **PROTECTIVE CLOTHING/EQUIPMENT:** Wear chemical-resistant gloves, boots, and aprons to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Viscous liquid
Appearance and Odor: Orange liquid with slight solvent odor.
Specific Gravity: 1.019 g/ml
Bulk Density: 8.506 lbs./gal.

Emergency Telephone Number: 1-800-858-7378
Revision Date: July 12, 2007

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: None known.
Incompatibility: Strong acids and strong oxidizers,
Hazardous Decomposition Products: Oxides of carbon.
Hazardous Polymerization: Will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Oral LD_{50} (rat): 55.3 – 264 mg/kg
Acute Dermal LD_{50} (rabbit): >2020 mg/kg
Inhalation LC_{50} (rat): 0.048 mg/L (4 HR)
Eye Irritation (rabbit): Moderately irritating
Skin Irritation (rabbit): Moderately irritating
Skin Sensitization (guinea pig): Not a sensitizer
Carcinogenic Potential: Not listed by IARC, NTP, or OSHA. ACGIH lists Rotenone as TLV A4: Not classifiable as to human carcinogenicity.

SECTION 12: ECOLOGICAL INFORMATION

This product is extremely toxic to fish. Fish kills are expected at recommended usage rates. Consult local Fish and Game agencies before applying this product to public waters to determine if a permit is needed for such an application.

SECTION 13: DISPOSAL CONSIDERATIONS

Do not reuse empty containers. **Plastic:** Triple rinse (or equivalent), then offer for recycling, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. **Metal:** Triple rinse (or equivalent), then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or by other procedures approved by state and local authorities. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law and may contaminate groundwater. Do not contaminate water, food or feed by storage or disposal.

SECTION 14: TRANSPORT INFORMATION

U.S DOT Shipping Description: Pesticide, Liquid, Toxic, N.O.S. (Rotenone), 6.1, UN2902, III, Marine Pollutant, ERG Guide 151Emergency Telephone Number: 1-800-858-7378

SECTION 15: REGULATORY INFORMATION

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) HAZARD RATINGS:

Category	Rating
Health	4
Flammability	2
Instability	0

0: Least
1: Slight
2: Moderate
3: High
4: Severe

SARA Hazard Notification/Reporting:
SARA Title III Hazard Category:
Immediate: Yes – Fire: No – Delayed: No – Reactive: No
Reportable Quantity (RQ) U.S. CERCLA: Not listed
SARA Title III, Section 313: N-methylpyrrolidone (CAS: 872-50-4) 10.0%
RCRA Waste Code: Not listed
California Proposition 65: WARNING: This product contains chemicals known to the State of California to cause cancer or birth defects or other reproductive harm.

SECTION 16: OTHER INFORMATION

Prepared by: ERR
Issue Date: July 12, 2007
Revision Notes: July 12, 2007
NOTE: *CFT Legumine is a Restricted Use Pesticide due to Aquatic Toxicity*

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, expressed or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state, and local laws and regulations.

RESTRICTED USE PESTICIDE

Due to Aquatic Toxicity and Acute Inhalation

For retail sale to, and use only by, Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

NOXFISH®

Fish Toxicant
Liquid-Emulsifiable

FOR CONTROL OF FISH IN LAKES, PONDS, RESERVOIRS AND STREAMS

ACTIVE INGREDIENTS:	
Rotenone	5.0% w/w
Other Associated Resins	10.0%
INERT INGREDIENTS*	85.0%
	100.0% w/w

*This product contains aromatic hydrocarbons.
®Noxfish is a registered trademark of Roussel Uclaf Corporation.

EPA REG. NO. 432-172 **EPA EST. NO.**

KEEP OUT OF REACH OF CHILDREN
DANGER

POISONOUS

STATEMENT OF PRACTICAL TREATMENT

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.

IF SWALLOWED: Promptly drink a large quantity of milk, egg white, gelatin solution or if these are not available, large quantities of water. Avoid alcohol. Do not induce vomiting. Call a physician or Poison Control Center.

IF ON SKIN: Wash with plenty of soap and water. Get medical attention.

See Below For Additional Precautionary Statements.

NET CONTENTS

ROUSSEL UCLAF
Roussel Uclaf Corporation
95 Chestnut Ridge Road
Montvale, NJ 07645

172s 070793dk

PRECAUTIONARY STATEMENTS

Hazards to Humans & Domestic Animals

DANGER
Fatal if inhaled. May be fatal if swallowed. Harmful if absorbed through skin. Causes substantial but temporary eye injury. Causes skin irritation. Do not breath spray mist. Do not get in eyes, on skin or on clothing. Wear goggles or safety glasses.

Wear either a respirator with an organic-vapor removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix 14G).

Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse.

Environmental Hazards

This pesticide is extremely toxic to fish. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate untreated water when disposing of equipment washwaters.

Chemical and Physical Hazards

FLAMMABLE. KEEP AWAY FROM HEAT AND OPEN FLAME.
FLASH POINT MINIMUM 49°F (7

DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
Storage: Store only in original containers, in a dry place inaccessible to children and pets. Noxfish will not solidify nor show any separation at temperatures down to 40°F and is stable for a minimum of one year when stored in sealed drums at 70°F.
Pesticide Disposal: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.
Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning or puncture and dispose of in a sanitary landfill or by other procedures approved by state and local authorities.

General Information

Noxfish is a specially formulated product containing rotenone to be used in fisheries management for the eradication of fish from lakes, ponds, reservoirs and streams.

Since such factors as pH, temperature, depth and turbidity will change effectiveness. Use this product only at locations, rates, and times authorized and approved by appropriate state and federal fish and wildlife agencies. Rates must be within the range specified on the label.

SPECIMEN LABEL

Properly dispose of dead fish and unused product. Do not use dead fish for food or feed.
Do not use water treated with rotenone to irrigate crops or release within 1\2 mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond or reservoir.

Re-entry Statement: Do not allow swimming in rotenone-treated water until the application has been completed and all pesticide has been thoroughly mixed into the water according to labeling instructions.

For Use in Ponds, Lakes and Reservoirs

The actual application rates and concentrations of rotenone needed to control fish will vary widely, depending on the type of use (e.g. selective treatment, normal pond use, etc.) and the factors listed above. The table below is a general guide for the proper rates and concentrations.

Noxfish disperses readily in water both laterally and vertically, and will penetrate below the thermocline in thermally stratified bodies of water.

Computation of Acre Feet: An acre-foot is a unit of volume of a body of water having the area of one acre and the depth of one foot. To determine acre feet in a given body of water, make a series of transects across the body of water taking depths with a measured pole or weighted line. Add the soundings and divide by the number made to determine the average depth. Multiply this average depth by the total surface area in order to determine the acre feet to be treated. If the number of surface acres is unknown, contact your local Soil Conservation Service, which can determine this from aerial photographs.

Amount of Noxfish Needed for Specific Uses: To determine the approximate number of gallons of Noxfish (5.0% Rotenone) needed, find your "Type of Use" in the first column of the table below and then divide the corresponding numbers in the fourth column, "Number of Acre-Feet Covered by One Gallon" into the number of acre-feet in your body of water.

Pre-Mixing and Method of Application: Pre-mix with water at a rate of one gallon Noxfish to 10 gallons of water. Uniformly apply over water surface or bubble through underwater lines.

Detoxification: Noxfish treated waters detoxify under natural conditions within one week to one month depending upon temperatures, alkalinity, etc. Rapid detoxification can be accomplished by adding chlorine or potassium permanganate to the water at the same rate as Noxfish in parts per million, plus enough additional to meet the chlorine demand of the untreated water.

Removal of Taste and Odor: Noxfish treated waters do not retain a detectable taste or odor for more than a few days to a maximum of one month. Taste and odor can be removed immediately by treatment with activated charcoal at a rate of 30 ppm for each 1 ppm Noxfish remaining. (Note: As Noxfish detoxifies, less charcoal is required.)

Restocking After Treatment: Wait 2 to 4 weeks after treatment. Place a sample of fish to be stocked in wire cages in the coolest part of the treated waters. If the fish are not killed within 24 hours, the water may be restocked.

Use in Streams Immediately Above Lakes, Ponds and Reservoirs

The purpose of treating streams immediately above lakes, ponds and reservoirs is to improve the effectiveness of lake, pond and reservoir treatments by preventing target fish from moving into the stream corridors, and not to control fish in streams per se. The term "immediately" means the first available site above the lake, pond or reservoir where treatment is practical, while still creating a sufficient barrier to prevent migration of target fish into the stream corridor.

In order to completely clear a fresh water aquatic habitat of target fish, the entire system above or between fish barriers must be treated. See the use directions for streams and rivers on this label for proper application instructions.

In order to treat a stream immediately above a lake, pond or reservoir, you must: (a) select the concentration of active rotenone, (b) compute the flow rate of the stream, (c) calculate the application rate, (d) select an exposure time, (e) estimate the amount of product needed, (f) follow the method of application. To prevent movement of fish from the pond, lake or reservoir, stream treatment should begin before and continue throughout

General Guide to the Application Rates and Concentrations of Rotenone Needed to Control Fish in Lakes, Ponds and Reservoirs[1]

Type of Use	Parts Per Million		Number of Acre-Feet Covered by One Gallon
	Noxfish	Active Rotenone	
Selective treatment	0.10 to 0.15	0.005 to 0.007	30 to 24
Normal pond use	0.5 to 1.0	0.025 to 0.050	6.0 to 3.0
Remove bullheads or carp	1.0 to 2.0	0.050 to 0.100	3.0 to 1.5
Remove bullheads or carp in rich organic ponds	2.0 to 4.0	0.100 to 0.200	1.5 to 0.75
Preimpoundment treatment above dam	5.0 to 5.0	0.150 to 0.250	1.0 to 0.60

[1] Adapted from Kinney, Edward. 1965. Rotenone in Fish Pond Management. USDI Washington, D.C. Leaflet FL-576.

treatment of the pond, lake or reservoir until mixing has occurred.

1. Concentration of Active Rotenone
Select the concentration of active rotenone based on the type of use from those listed on the table. Example: If you select "normal pond use", you could select a concentration of 0.025 part per million.

2. Computation of Flow Rate for Stream
Select a cross section of the stream where the banks and bottom are relatively smooth and free of obstacles. Divide the surface width into 3 equal sections and determine the water depth and surface velocity at the center of each section. In slowly moving streams, determine the velocity by dropping a float attached to 5 feet of loose monofilament fishing line. Measure the time required for the float to move 5 feet. For fast-moving streams, use a longer distance. Take at least three readings at each point. To calculate the flow rate from the information obtained above, use the following formula:

$$F = \frac{W_s \times D \times L \times C}{T}$$

Where F = flow rate (cubic feet/second), W_s = surface width (feet), D = mean depth (feet), L = mean distance traveled by float (feet), C = constant (0.8 for rough bottoms and 0.9 for smooth bottoms), and T = mean time for float (sec.).

3. Calculation of Application Rate
In order to calculate the application rate (expressed as gallons/second), convert the rate in the table (expressed as gallons/acre-feet) to gallons per cubic feet and multiply by the flow rate (expressed as cubic feet/second). Depending on the size of the stream and the type of equipment, the rate could be expressed in other units, such as ounces/hour or cc/minute.

The application rate for the stream is calculated as follows:

$$R_s = R_p \times C \times F$$

Where R_s = application rate for stream (gallons/second), R_p = application rate for pond (gallons/acre-feet), C = 1 acre foot/43,560 cubic feet, and F = flow rate of the stream (cubic feet/ second).

4. Exposure Time
The exposure time would be the period of time (expressed in hours or minutes) during which Noxfish is applied to the stream in order to prevent target fish from escaping from the pond into the stream corridor.

5. Amount of Product
Calculate the amount of product for a stream by multiplying the application rate for streams by the exposure time.

$$A = R_s \times H$$

Where A = the amount of product for the stream application, R_s = application rate for stream (gallons/second), and H = the exposure time expressed in seconds.

For Use in Streams and Rivers
Only state or federal fish and wildlife personnel or professional fisheries biologists under the authorization of state or federal fish and wildlife agencies are permitted to make applications of Noxfish for control of fish in streams and rivers. Informal consultation with Fish and Wildlife personnel regarding the potential occurrence of endangered species in areas to be treated should take place. Applicators must reference Roussel Uclaf Corporation's Noxfish Stream and River Use Monograph before making any application to streams or rivers.

Warranty Statement: Our recommendations for use of this product are based upon tests believed to be reliable. The use of this product being beyond the control of the manufacturer, no guarantee, expressed or implied, is made as to the effects of such or the results to be obtained if not used in accordance with directions or established safe practice. The buyer must assume all responsibility, including injury or damage, resulting from its misuse as such, or in combination with other materials.

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List) [redacted]

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name ARGENT CHEMICAL LABORATORIES, INC.	Emergency Telephone Number (206) 885-3777
Address (Number, Street, City, State, and ZIP Code) 8702 152nd Ave. N.E.	Telephone Number for Information (206) 885-3777
Redmond, WA 98052	Date Prepared 10/12/88
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Rotenone (CAS 83-79-4)	5 mg/M^3		10 mg/M^3 (STEL)	
Acetone (CAS 67-64-1)	1000 ppm			
Aromatic Petroleum Solvents			100 ppm (TWA)	
Xylene range Aromatic solvent	100 ppm		150 ppm (STEL)	

Poisonous if swallowed or absorbed through skin.

Section III — Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_2O = 1)	0.92-0.96
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
Dispersible

Appearance and Odor
Light brown, clear liquid with characteristic mild aromatic odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
50°F (T.C.C.)	N/A	N/A	N/A

Extinguishing Media
Foam, CO_2, dry chemical extinguishers.

Special Fire Fighting Procedures
Material is a flammable liquid. Wear self-contained breathing apparatus and full bunker gear to minimize contact with skin, eyes, or respiratory tract.

Unusual Fire and Explosion Hazards
Extinguish all sources of ignition. Keep containers cool with water spray. Prevent spread of contaminated run-off into surface waters or sewers.

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		Heat, spark, open flame. Material is flammable.
	Stable	X	

Incompatibility (Materials to Avoid)
Strong oxidizers.

Hazardous Decomposition or Byproducts
Thermal decomposition may yield carbon monoxide/dioxide and oxides of nitrogen.

Hazardous Polymerization			Conditions to Avoid
	May Occur		None known
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	X	X	X

Health Hazards (Acute and Chronic)
Causes irritation of eyes, skin and mucous membranes. Poisonous if ingested or absorbed th
skin. Exposure to eyes may cause irreversible damage. Aspiration may lead to pulmonary
edema.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	Not listed with NTP, in the IARC Monographs, nor regulated by OSHA as a carcinogen.		

Signs and Symptoms of Exposure
Irritation of eyes, skin or respiratory tract. Ingestion may lead to nausea, vomiting, tre
abdominal pain, inconsciousness.

Medical Conditions
Generally Aggravated by Exposure None known.

Emergency and First Aid Procedures
INGESTION: Do not induce vomiting. Call physician. INHALATION: Move victim to fresh air an
administer artificial respiration as needed. Call physician. EYES: Flush with running wat
for 15 min. Call physician. SKIN: Wash thoroughly with water for 15 min.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled
Use absorbants to dike and absorb material. Place soaked absorbants into DOT-approved cont
and hold for disposal. Decontaminate with strong detergent, rinse, then bleach and rinse
again. Do not contaminate surface waters or sewers. Material is toxic to fish. Avoid breath
ing vapors.

Waste Disposal Method
Dispose of in accordance with all applicable Federal, State and Local laws. Do not contami
surface waters or sewers.

Precautions to be Taken in Handling and Storing
Avoid contact with skin. Do not ingest. Avoid breathing vapors. Wash thoroughly after using
Keep container tightly closed.

Other Precautions
Store away from heat or flame. Do not contaminate feed, foodstuffs or water supplies.

Section VIII — Control Measures

Respiratory Protection (Specify Type)
NIOSH/MSHA-approved respirator with pesticide carrridge.

Ventilation			
	Local Exhaust	Special	
	Use in well-ventilated area		N/A
	Mechanical (General)	Other	
	To meet exposure limits		N/C

Protective Gloves	Eye Protection
Chemical-resistant	Chemical splash goggles.

Other Protective Clothing or Equipment
To prevent contact with skin.

Work/Hygienic Practices
Wash thoroughly after handling. Do not wear contaminated clothing.

Product: 655-422 Prentox® Prenfish™ Toxicant

Material Safety Data Sheet
U.S. Department of Labor (OSHA 29 CFR 1910.1200)

Manufacturer's Name: **Prentiss Incorporated**
C. B. 2000
Floral Park, NY 11001
Telephone Number: **(516) 326-1919**

Section 1: Chemical Identification

Product: 655-422	**Prentox® Prenfish™ Toxicant**	
EPA Signal Word:	DANGER	
Active Ingredient (%):	Rotenone (5%)	(CAS # 83-79-4)
	Other Cube Resins (10%)	N/A
Chemical Names:	Rotenone – N/A	
Chemical Class:	Mixture	

Section 2: Composition/ Information 0n Ingredients

Material:	OSHA PEL	ACGIH TLV	Other	NTP/IARC/OSHA Carcinogen
Rotenone	(TWA) 5 mg/ M^3	(STEL) 10 mg/M^3 (TWA) 5 mg/M^3		No/No/No
Other associated cube resins	Not Est.	Not Est.		
Aromatic Petroleum Solvent (Supplier recommendation 100 ppm) (CAS # 64742-94-5) (Not to exceed 80%)				
Contains the following ingredients, by weight (typical):				
Naphthalene (CAS # 91-20-3)		9.9%	(TWA) 10 ppm	
1,2,4-trimethylbenzene (CAS # 95-63-6)		1.7%	(TWA) 25 ppm	
Acetone (CAS # 67-64-1) (not to exceed 7.5%)			(TWA) 250 ppm	
Emulsifier #1 (CAS # N/A)		1.5%	N/D	
Emulsifier #2 (CAS # N/A)		4.5%	N/D	

Section 3: Hazards Identification

Clear liquid with mild odor. Fatal if inhaled. May be fatal if swallowed. Harmful if absorbed through skin. Causes substantial but temporary eye injury. Causes skin irritation. This pesticide is extremely toxic to fish.

Potential Health Effects:
Primary Routes of Entry: Inhalation, ingestion, skin and eye contact.

Health Hazards (Acute and Chronic): Causes mucous membrane irritation. Chronic exposure can cause damage to liver and/or kidneys. May be fatal if swallowed. May cause eye injury. Causes skin irritation. Do not get in eyes, on skin or on clothing. Toxicity of other components: This product contains an aromatic solvent. Inhalation of solvent vapors at high concentrations are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death. Aspiration of solvent during vomiting may cause mild to severe pulmonary injury, possibly progressing to death. Frequent or prolonged skin contact may irritate and cause dermatitis. Skin contact may aggravate an existing dermatitis condition. Emulsifiers may cause severe eye injury.
Signs and Symptoms of Overexposure: Can cause skin irritation. Ingestion or inhalation can cause numbness, nausea, vomiting and tremors.
Medical Conditions Generally Aggravated by Exposure: None known.

Section 4: First Aid Measures

If swallowed, call a physician or Poison Control Center. Do not induce vomiting. This product contains aromatic petroleum solvent. Aspiration may be a hazard. Promptly drink a large quantity of milk, egg white, and gelatin solution, or if these are not available, water. Avoid alcohol.
If inhaled, remove victim to fresh air. If not breathing, administer artificial respiration, preferably by mouth to mouth. Get medical attention.
If on skin, wash with plenty of soap and water. Get medical attention if irritation persists.
If in eyes, flush eyes with plenty of water. Get medical attention if irritation persists.

Section 5: Fire Fighting Measures

Fire and Explosion

Flash Point (Method Used):		60º F. Closed cup.				
Flammable Limits:	LEL: 1.8		UEL: 11.7 (Solvent - approximate)			
NFPA Hazard Ratings:	**Health:**	3	**Flammability:**	4	**Reactivity:**	0

Extinguishing Media: CO_2, foam, dry chemical, or water spray.
Special Fire Fighting Procedures: Do not inhale smoke. Use self-contained breathing apparatus and protective clothing. This product is extremely toxic to fish, and is toxic to birds and other wildlife, prevent spread of contaminated runoff.
Unusual Fire and Explosion Hazards: When heated to decomposition, product emits acrid smoke and fumes.
Flammability Classification/Rating:
NFPA/OSHA Class: I
NFPA Rating (Fire): 4

Section 6: Accidental Release Measures

Wear protective equipment, as required, to prevent contact with product or its vapors. Cover the spilled material with generous amounts of absorbent material, such as clay, diatomaceous earth, sand or sawdust. Sweep the contaminated absorbent onto a shovel and put the sweepings into a salvage drum. Dispose of wastes as below. Place any leaking container into a similar drum or glass container. Mark the drum or container with name of product, ingredient statement, precautionary statements and signal word. Contact us for replacement label. This product is extremely toxic to fish. Fish kills are expected at recommended rates. Keep it out of lakes, streams or ponds except under use conditions.

Section 7: Handling and Storage

Do not contaminate water, food or feed by storage or disposal. Store in a dry place away from temperature extremes. Avoid inhalation of vapors. Harmful if swallowed, inhaled or absorbed through skin. Avoid contact with skin. Wear clean protective clothing.

Other precautions: Periodically inspect stored materials.

Section 8: Exposure Controls/Personal Protection

Respiratory protection: Mixers and handlers: Do not inhale. Use NIOSH certified respirator for organic vapor protection.

Ventilation:

Local Exhaust:	As required to meet TLV.
Special:	Not applicable.
Mechanical:	As required to meet TLV.
Other:	Not applicable.

Protective Gloves: Chemical resistant.

Eye Protection: Safety glasses, face shield or goggles.

Other protective clothing or equipment: Wear long pants, long sleeved shirt or other body covering clothes. Avoid skin or eye contact.

Work/Hygienic practices: Wash thoroughly after handling and before eating or smoking. Remove contaminated clothing and wash thoroughly before reuse.

Section 9: Physical and Chemical Properties

Appearance:	Amber Liquid
Odor:	Aromatic Solvent Odor
Boiling Point:	N/D
Specific Gravity (H_2O = 1):	0.9226
Vapor Pressure (mmHg):	N/D
Melting Point:	N/D
Vapor Density (Air = 1):	N/D
Evaporation Rate (Butyl Acetate = 1):	N/D
Solubility in Water:	Emulsifies.

Section 10: Stability and Reactivity

Stability:	Stable.
Conditions to avoid for stability:	None.
Incompatibility:	Strong acids and oxidizers.
Hazardous Decomposition or Byproducts:	CO, CO_2
Hazardous Polymerization:	Will not occur.
Conditions to avoid for Hazardous Polymerization:	None.

Section 11: Toxicological Information

Acute Toxicity/Irritation Studies:

(The following data were developed with Prenfish)

Ingestion:	Oral LD_{50}	55.3 mg/Kg (Rat – female)
		264 mg/Kg (Rat – male)
		178 mg/Kg (Rat – overall)
Dermal:		>2020 mg/Kg (Rabbit) (Slightly toxic)
Inhalation:		4-hour LC_{50} 0.048 mg/l. (Rat) (Highly toxic)
Eye Contact:		Moderately irritating (Rabbit)
Skin Contact:		Moderately irritating (Rabbit)
Skin Sensitization:		Non-sensitizing (Guinea Pig)

(The following data were developed with rotenone technical)

Mutagenic Potential: Rotenone was not mutagenic when tested.

Reproductive Hazard Potential: Rotenone had no reproductive effects when tested

Chronic/Subchronic Toxicity Studies:

Cancer Information: Rotenone was not carcinogenic when tested in rats and mice.

Toxicity of Other Components:

Petroleum solvent: The supplier reports that inhalation of high vapor concentrations (over 1,000 ppm) may cause nervous system effects such as headaches, dizziness, anesthesia and respiratory tract irritation

Surfactant: Causes severe eye irritation, which could lead to permanent eye damage. Prolonged or repeated skin contact may cause discomfort and local redness. Mist can irritate the respiratory tract, experienced as nasal discomfort and discharge with chest pain and coughing.

Target Organs: Eyes, skin, respiratory tract.

Section 12: Ecological Information

Summary of Effects: This product is extremely toxic to fish. Fish kills are expected at recommended rates. Consult your State Fish and Game Agency before applying this product to public waters to determine if a permit is needed for such an application. Do not contaminate untreated water when disposing of equipment washwaters.

Section 13: Disposal Considerations

Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities.

Section 14: Transport Information

DOT Classification: Pesticide liquid, flammable, toxic, n.o.s. (Acetone, Rotenone)
Hazard Class: 3, PG I
Subsidiary hazard class: 6.1
DOT Shipping Label: Poison and/or Toxic

Note: For transport purposes (49FR Part 173.132), the calculated 1-hour LC50 (Rat) is: 0.192 mg/L

Section 15: Regulatory Information

SARA Title III Classification:

Section 311/312:

Acute health hazard
Fire hazard

Section 313 Chemicals:

Aromatic Petroleum Solvent (Supplier recommendation 100 ppm) (CAS # 64742-94-5)
(Not to exceed 80%)
Contains the following ingredients, by weight (typical):

Naphthalene (CAS # 91-20-3)	9.9%	(TWA) 10 ppm
1,2,4-trimethylbenzene (CAS # 95-63-6)	1.7%	(TWA) 25 ppm

This product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372. Any copies or redistribution of this MSDS must include this notice.

Proposition 65: This product does not contain any chemical which is known to the State of California to cause cancer or birth defects or other reproductive harm.
CERCLA Reportable Quantity (RQ): None.
RCRA Classification: Ignitable.
TSCA Status: Registered pesticide, exempt from TSCA regulation. All ingredients are on the TSCA inventory.
Other: Rotenone

Illinois toxic substance
Massachusetts Hazardous Substance
New Jersey Special Health Hazardous Substance
Pennsylvania Workplace Hazardous Substance

Acetone

Massachusetts Hazardous Substance
New Jersey Environmental Hazardous Substance
New Jersey Special Health Hazardous Substance
New Jersey Workplace Hazardous Substance
Pennsylvania Workplace Hazardous Substance

Section 16: Other Information

NFPA Hazard Ratings:	**Health:**	3	0	Least
	Flammability:	4	1	Slight
	Reactivity:	0	2	Moderate
			3	High
			4	Severe

Date Prepared: August 10, 2000
Supersedes: February 2, 1994
Reason: Revised Format

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.

AROMATIC 200

ExxonMobil
Lubricants &
Petroleum Specialties

DATE ISSUED: 09/21/00
SUPERSEDES DATE: 05/25/99

MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

COMPANY: Exxon Mobil Corporation
ExxonMobil Lubricants & Petroleum
Specialties Company
3225 Gallows Road
Fairfax, VA 22037-0001

PRODUCT NAME
AROMATIC 200

PRODUCT CODE
132655

PRODUCT CATEGORY
Petroleum Solvent

MEDICAL EMERGENCY TELEPHONE NUMBER: (713) 656-3424

TRANSPORTATION EMERGENCY TELEPHONE NUMBERS
(BAYTOWN) (281) 834-3296 (CHEMTREC) 1-800-424-9300

Product Information and Technical Assistance: 1-800-443-9966

FAXED MSDSs: 1-800-298-4007 MAILED MSDSs OR OTHER ASSISTANCE: (713) 656-5949

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	CAS NO. OF COMPONENTS	APPROXIMATE CONCENTRATION
Solvent naphtha (petroleum), heavy aromatic	64742-94-5	100%

This product consists predominantly of C9-C15 aromatic hydrocarbons, primarily C10-C12.

It includes:

Naphthalene	91-20-3	Approximately 14 mass %

SEE SECTION 8 FOR EXPOSURE LIMITS

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

OSHA REQUIRED LABEL INFORMATION
In compliance with hazard and right-to-know requirements, where applicable

OSHA Hazard Warnings may be found on the label, bill of lading or invoice accompanying this shipment.

Note: Product label may contain non-OSHA related information also.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	Flammability	Reactivity	BASIS
1	1	0	Recommended by ExxonMobil

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) - HAZARD IDENTIFICATION

Health	Flammability	Reactivity	BASIS
1	1	0	Recommended by ExxonMobil

VARIABILITY AMONG INDIVIDUALS

Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)

High vapor concentrations (greater than approximately 1000 ppm) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

SECTION 4: FIRST AID MEASURES

EYE CONTACT

If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN

In case of skin contact, remove any contaminated clothing and wash skin with soap and water. Launder or dry-clean clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INHALATION

If overcome by vapor, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION

If ingested, DO NOT induce vomiting; call a physician immediately.

SECTION 5: FIRE-FIGHTING MEASURES

FLASH POINT (MINIMUM)
95~C (203~F)
ASTM D 93, Pensky Martens Closed Cup

AUTOIGNITION TEMPERATURE
Approximately 484~C (904~F)
ASTM E 659

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 1.8% Upper Flammable Limit 11.8%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.

The following procedures for this type of product are based on the recommendations in the National Fire Protection Association's "Fire Protection Guide on Hazardous Materials", Tenth Edition (1991):

Use dry chemical, foam or carbon dioxide to extinguish the fire. "Water may be ineffective", but water should be used to keep fire-exposed containers cool. If a leak or spill has ignited, use water spray to disperse the vapors and to protect persons attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

NOTE: The inclusion of the phrase "water may be ineffective" is to indicate that although water can be used to cool and protect exposed material, water may not extinguish the fire unless used under favorable conditions by experienced fire fighters trained in fighting all types of flammable liquid fires.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

SECTION 6: ACCIDENTAL RELEASE MEASURES

CLEAN WATER ACT / OIL POLLUTION ACT
This product may be classified as an oil under Section 311 of the Clean Water Act, and under the Oil Pollution Act. Discharges or spills into or leading to surface waters that cause a sheen must be reported to the National Response Center (1-800-424-8802).

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.

Assure conformity with applicable governmental regulations. Continue to observe precautions for volatile, combustible vapors from absorbed material.

SECTION 7: STORAGE AND HANDLING

HANDLING PRECAUTIONS
Use product with caution around heat, sparks, pilot lights, static electricity, and open flame.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

Do not attempt to refill or clean containers since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMIT FOR TOTAL PRODUCT	BASIS
15 ppm (100 mg/m3) based on total hydrocarbon for an 8-hour workday.	Recommended by ExxonMobil
10 ppm (50 mg/m3) for an 8-hour workday and a STEL of 15 ppm (75 mg/m3) for Naphthalene.	OSHA Regulation 29 CFR 1910.1000
10 ppm (52 mg/m3) for an 8-hour workday and a STEL of 15 ppm (79 mg/m3) for Naphthalene, with skin and A4 designations.	Recommended by the American Conference of Governmental Industrial Hygienists (ACGIH)

The recommended permissible exposure levels indicated above reflect the levels revised by OSHA in 1989 or in subsequent regulatory activity. Although the 1989 levels have since been vacated by the 11th Circuit Court of Appeals, ExxonMobil recommends that the lower exposure levels be observed as reasonable worker protection.

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. No smoking, or use of flame or other ignition sources.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid

contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
To prevent fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system in accordance with (THE) National Fire Protection Association PUBLICATIONS.

Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants. To prevent fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system in accordance with the National Fire Protection Association standard for petroleum products.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor or mist. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean and dry before re-use. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
232-275~C (450-527~F)

SPECIFIC GRAVITY (15.6 Deg C/15.6 Deg C)
1.00 (8.33 lb/gal)

MOLECULAR WEIGHT
161

pH
Essentially neutral

POUR, CONGEALING OR MELTING POINT
-9~C (15~F)
Pour Point by ASTM D 97

VISCOSITY
2.60 cSt @ 25 Deg C (77 Deg F) ASTM D 445

VAPOR PRESSURE
Less than 0.1 mm Hg @ 20~C (68~F)
ASTM D 2879

VAPOR DENSITY (AIR = 1)
4.7

PERCENT VOLATILE BY VOLUME
Approximately 50% in 1,083 minutes
@ 1 atm. and 25~C (77~F)

EVAPORATION RATE @ 1 ATM. & 25 Deg C
(77 Deg F) (n-BUTYL ACETATE = 1)
Less than 0.01

SOLUBILITY IN WATER @ 1 ATM.
AND 25 Deg C (77 Deg F)
Negligible; 0.001%

PRODUCT APPEARANCE AND ODOR

Clear liquid, light yellow color
Aromatic hydrocarbon odor

SECTION 10: STABILITY AND REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc., as this presents a serious explosion hazard.

SECTION 11: TOXICOLOGICAL INFORMATION

NATURE OF HAZARD AND TOXICITY INFORMATION

Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 3 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3 g/kg of body weight.

At repeated high oral doses in rats, this product caused damage to the stomach, liver, thyroid, and urinary bladder. These effects are not relevent to humans at occupational levels of exposure.

SECTION 12: ECOLOGICAL INFORMATION

Do not discharge this product into public waters or waterways unless authorized by a National Pollution Discharge Elimination System (NPDES) permit issued by the Environmental Protection Agency (EPA).

Environmental and Ecological data may be available for this product. Write or call ExxonMobil to obtain further information. Refer to Section 6 and Section 15 for Accidental Release information and Regulatory Reporting information.

SECTION 13: DISPOSAL CONSIDERATION

Options for disposal of this product may depend on the conditions under which it was used. To determine the proper method of disposal, refer to RCRA (40 CFR 261), as well as federal EPA and state and local regulations.

Please refer to Sections 5, 6 and 15 for additional information.

SECTION 14: TRANSPORTATION INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents.

U.S. DOT HAZARDOUS MATERIALS SHIPPING DESCRIPTION
Transported by highway, rail or air:

Bulk packagings (capacity greater than 119 gallons)
Environmentally Hazardous Substance, Liquid, n.o.s. (Methylnaphthlenes, Liquid and Naphthalene), 9, UN 3082, III, Marine Pollutant

Non-bulk packagings (capacity less than or equal to 119 gallons)
Not Regulated

Transported by marine vessel:

Bulk and non-bulk packagings
Environmentally Hazardous Substance, Liquid, n.o.s. (Methylnaphthlenes, Liquid and Naphthalene), 9, UN 3082, III, Marine Pollutant

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355
(SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
This product contains approximately 14% naphthalene.

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)
EPA Hazard Classification Code: Chronic

TOXIC SUBSTANCES CONTROL ACT (TSCA)
This product, as manufactured by ExxonMobil, does not contain polychlorinated biphenyls (PCB's).

All components of this product are listed on the U.S. TSCA inventory.

SECTION 16: OTHER INFORMATION

The health and safety information presented herein must be used in conjunction with the pertinent standards for training, work practices and facilities design established by OSHA, NIOSH, NFPA, API, NEC, NSC, UNDERWRITERS, BUREAU OF MINES, and similar organizations.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued.

ExxonMobil does not warrant or guarantee their accuracy or reliability, and ExxonMobil shall not be liable for any loss or damage arising out of the use thereof.

The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container.

The Environmental Information included under Section 15 hereof as well as the Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings have been included by ExxonMobil Lubricants & Petroleum Specialties Company, in order to provide additional health and hazard classification information. The ratings recommended are based upon the criteria supplied by the developers of these rating systems, together with ExxonMobil's interpretation of the available data.

MATERIAL SAFETY DATA SHEET

Harcros Chemicals Inc. DATE: 07-DEC-2009
MSDS No. 000079/ Revision No.05
Page 1

Section I. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CAS #: Mixture
CHEM. FAMILY: Organic Mixtures
FORMULA: Mixture
CHEMICAL NAME: T Mulz

PRODUCT NAMES: T-MULZ O; T-MULZ PR-2; T-MULZ 1149

SUPPLIERS NAME: Harcros Chemicals Inc.
5200 Speaker Road
Kansas City, KS 66106-1095

SUPPLIERS PHONE NUMBER: 913-321-3131
TRANSPORTATION EMERGENCY PHONE NUMBER: 1-800-424-9300

Section II. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
PRECAUTIONS
Wear protective equipment when handling. Use only with adequate ventilation. Wash thoroughly after handling. Do Not breathe vapor, mist, or dust. Do Not get in eyes, on skin, or clothing. Avoid prolonged or repeated conta with skin. Do not swallow.

ROUTE(S) OF ENTRY: Eye contact, skin contact, inhalation.

Potential Health Effects (ACUTE AND CHRONIC):
OVEREXPOSURE MAY AGGRAVATE DISORDERS OF THE:
Eyes, skin, respiratory system

OVEREXPOSURE MAY CAUSE DAMAGE TO,
DISORDERS OF, OR ADVERSELY AFFECT THE FOLLOWING SYSTEMS, FUNCTIONS, ORGANS:
Blood, Kidneys, Liver

CARCINOGENICITY:
No components, present in excess of 0.1% by weight are listed as carcinogens by IARC, NTP, or OSHA.

PROPOSTION 65:
WARNING: This product *may* contain trace amounts of chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

EYE: Eye contact with product may cause irritation, burns

SKIN: Skin contact may cause severe irritation.
Prolonged or repeated skin contact may cause severe irritation, dermatitis, burns. May be absorbed in harmful amounts.

Section II. HAZARDS IDENTIFICATION CONTINUED

INHALATION: Inhalation may cause irritation, coughing, headache, nausea, drowsiness.
Prolonged or repeated overexposure by inhalation may cause central nervous system (CNS) depression, hearing impairment. Symptoms of early to moderate central nervous system (CNS) depression include giddiness, dizziness, confusion, drunken behavior, headache, nausea, diarrhea, vomiting, tiredness and drowsiness. In extreme cases, symptoms of central nervous system (CNS) depression include stupor, convulsions, unconsciousness, coma, and even death.

INGESTION: Ingestion may cause irritation, nausea, vomiting, diarrhea, central nervous system (CNS) depression. Symptoms of early to moderate central nervous system (CNS) depression include giddiness, dizziness, confusion, drunken behavior, headache, nausea, diarrhea, vomiting, tiredness and drowsiness. In extreme cases, symptoms o central nervous system (CNS) depression include stupor, convulsions, unconsciousness, coma, and even death.

Section III. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS NUMBER	MAX Percentage%	EXPOSURE LIMIT TWA/TLV	STEL	CEIL	SKIN	AGEN
n-Butyl Alcohol	71-36-3	> or = 10.00	ppm	ppm	ppm		
1-Butanol			50	Y	OSHA		
			50	Y	ACGIH		
C(11-13) Branched Alkyl Benzene Sulfonic Acid, Calcium Salts	68953-96-8	> or = 20.00					

Section IV. FIRST AID MEASURES

EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes, while holding eyelids apart to ensure flushing of entire surface. Call a physician.

SKIN CONTACT:
Immediately flush skin with plenty of water for at least 15 minutes, while removing contaminated clothing and shoes. Thoroughly clean clothing and shoes before reuse. Call a physician.

INHALATION:
Remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult give oxygen. Call a physician.

INGESTION:
If swallowed, DO NOT induce vomiting unless so instructed by physician or poison control center. If vomiting occurs spontaneously, keep head below hips to prevent breathing of vomit into lungs. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.

Section V. FIRE FIGHTING MEASURES

FLASHPOINT (METHOD): > OR = 105 deg. F (PMCC)

FLAMMABLE LIMITS:(% Volume in Air) UPPER: N/D Lower: N/D

EXTINGUISHING MEDIA: Water fog, dry chemical, foam, carbon dioxide.

Section V. FIRE FIGHTING MEASURES CONTINUED

SPECIAL FIRE FIGHTING PROCEDURES: Prevent human exposure to fire, fumes, smoke, and products of combustion. Evacuate non-essential personnel. Firefighters should wear full face, self-contained breathing apparatus and impervious protective clothing. A direct stream of water may cause foaming.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapor may travel a considerable distance to a source of ignition a flash back.

FLAMMABILITY AND COMBUSTIBILITY: This product is flammable or combustible. Flash point is less than 142 degrees F. Keep liquid and vapor away from oxidizers, heat, sparks and flame. No smoking where material is us or stored. Surfaces that are sufficiently hot may ignite even liquid product in the absence of sparks or flame. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapors are gone. Vapors may accumulate and travel to ignition sources distant from the handling site; flash-fire can result. Keep containers closed when not in use. Use with adequate ventilation. Static electricity may accumulate and create a fire hazard. Ground fixed equipment. Bond and ground transfer containers and equipment. Contact with oxidizer may result in a fire and/or explosion. Containers, even those that have been emptied, can contain explosive vapo Do not cut, drill, grind, weld or perform similar operations on or near containers.

Section VI. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Evacuate non-essential personnel, eliminate ignition sources, and wear protective equipment (See Section VIII). Sh off source of leak only if safe to do so. Contain spill. Recover free product. To clean up residue, flush sparingly wit water or use an absorbent. Avoid runoff to ground water, surface waters, and sewers. It may be necessary to remove contaminated soil. If product is flammable or combustible, use non-sparking tools. If acidity (low pH) is a problem, neutralize with hydrated lime, soda ash, or sodium bicarbonate. If alkalinity (high pH) is a problem neutralize with dilute acetic acid or dilute hydrochloric (muriatic) acid. If required, notify state and local authorities. Product may be toxic to fish or aquatic life.

DISPOSAL METHOD:
Solids must be disposed of in a permitted waste management facility. Recovered liquids may be reprocessed or incinerated. Incineration must be handled in a permitted facility. Dispose of material in accordance with all Federal State and local regulations. Local regulations may be more stringent than Federal or State. Product may cause foaming problems.

Section VII. HANDLING AND STORAGE

For industrial use only. Keep heat, lights, fire, and sparks away. Drum must be grounded and bonded to receiving container when being emptied. Use spark proof tools when handling.

STORAGE:
Keep container closed when not in use. Store away from oxidizers. Do not store above 120 deg. F. in aluminum equipment. Keep out of reach of children.

Section VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:
Local exhaust is desired in closed places.
Mechanical exhaust is required to maintain exposure levels below limits.

Section VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION CONTINUED.

RESPIRATORY PROTECTION: If exposure limits are exceeded, or if exposure may occur, use a NIOSH/MSHA respirator approved for your conditions of exposure. Refer to the most recent NIOSH publications concerning chemical hazards, or consult your safety equipment supplier. Respiratory protection programs must be in compliance with OSHA requirements in 29 CFR 1910.134. For emergencies, a NIOSH/MSHA approved positive pressure breathing apparatus should be readily available.

EYE PROTECTION: Chemical Goggles. Always wear eye protection when working with chemicals. Do Not wear contact lenses when working with chemicals.

SKIN PROTECTION: impervious gloves, clean body covering.

OTHER PROTECTIVE EQUIPMENT:
Safety shower, eye wash fountain, and washing facilities should be readily available.

WORK HYGIENIC PRACTICES: Avoid contact with skin, eyes, and clothing. After handling this product, wash hands before eating, drinking, or smoking. If contact occurs, remove contaminated clothing. If needed, take First Aid action shown in Section IV. Launder contaminated clothing before reuse.

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Section IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colored liquid
Odor: Sharp
pH: aqueous approx. 5.000 to 7.000
Boiling point/boiling range: > or = to 300 deg. F
Freezing Point: N/D
Flash Point: 105 deg. F (PMCC)
Vapor Pressure: (MM HG.): N/D
Vapor Density: (Air =1): > or = to 1.000
Solubility In Water: Emulsifies
Specific Gravity:(H2O=1): > or = to 1.0300 @ 68 deg. F
Evaporation Rate: (NA=1): N/D
Percent Volatile by Volume: N/D

Section X. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

MATERIALS TO AVOID: Inorganic acids, inorganic bases. Avoid contact with bleaching agents and oxidizers, which include chlorine, oxygen, permanganates, perchlorates, percarbonates, peroxides, chromates, hypochlorites, nitric acid, and sulfuric acid.

CONDITIONS TO AVOID: Heat, heated surfaces, static electricity, electric arcs, sparks and flames.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Carbon monoxide, Carbon Dioxide, miscellaneous organic compounds, some possibly toxic. Oxides of sulfur

HAZARDOUS POLYMERIZATION: Will not occur

Section XI. TOXICOLOGICAL INFORMATION

ANIMAL TEST DATA
BASED ON LABORATORY TEST DATA MAY CAUSE DAMAGE TO, DISORDERS OF, OR ADVERSELY AFFECT THE FOLLOWING SYSTEMS, FUNCTIONS, ORGANS:
Blood, kidneys, liver.

Section XII. ECOLOGICAL INFORMATION

Not Available.

Section XIII. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: EPA approved Hazardous Waste Site. Follow applicable local, state, and federal regulations.

Section XIV. TRANSPORT INFORMATION

DOT (Department of Transportation)
Proper Shipping Name: Combustible Liquid, NOS (Butyl Alcohol)
UN/NA Number: NA1993
Packaging Group: III
Label Requirements: Combustible Liquid
Reportable Quantity (RQ): 5000 lbs.

Section XV. REGULATORY INFORMATION

S.A.R.A
HAZARDS: Acute Fire Chronic
PHYSICAL DATA: Mixture Liquid

EPCRA APPLIES:
n-Butyl Alcohol (CAS# 71-36-3)
312: Y
313: Y
CAS: 68953-96-8
312: Y
313: N

TSCA INVENTORY STATUS: Listed
TSCA, 40 CFR 710: Sources of the raw materials used in this mixture assure that all chemical ingredients present are in compliance with Section 8(b) Chemical Substance Inventory, or are otherwise in compliance with TSCA.

INTERNATIONAL INVENTORIES:
Canada (DSL): Listed
Japan (MITI/ENCS): Listed
Australia (AICS): Listed
China (CIS): Listed
Europe (EINECS): Listed

Section XV. REGULATORY INFORMATION Continued.

WHMIS Classification: D2B, Irritant; B2 Flammable Liquid (Flash Point 75 deg F. TCC)

REACH Classification: R10 – Xn; R22 - Xi; R37/38-41

+R10: Flammable
+R22: Harmful if swallowed.
+R37/38: Irritating to respiratory system and skin.
+R41: Risk of serious damage to eyes.
+R67: Vapors may cause Drowsiness and dizziness.
+S2: Keep out of the reach of children.
+S7/9: Keep container tightly closed an in a well-ventilated place.
+S13: Keep away from food, drink and animal feedstuffs
+S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
+S37/39: Wear Suitable gloves and eye/face protection.
+S46: If swallowed, seek medical advice immediately and show this container.

This product contains Ethoxylated Phenol which is listed in Annex 1 of Export and Import of Dangerous Chemicals Regulation (EC) No. 689/2008 information.

Section XVI. OTHER INFORMATION

HMIS HEALTH:	2	DATE ISSUED: 920324
FLAMMABILITY:	2	DATE REVISED: 091207
REACTIVITY:	0	SECTIONS: REACH & WHMIS
PERSONAL PROTECTION:	X	

The information provided in this Material Safety data sheet has been obtained from sources believed to be reliable. Harcros Chemicals Inc provides no warranties, either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. This information is offered for your information, consideration, and investigation. You should satisfy yourself that you have all current data relevant to your particular use. Harcros Chemicals Inc knows of no medical condition, other than those noted on this material safety data sheet, which are generally recognized as being aggravated by exposure to this product.

MATERIAL SAFETY DATA SHEET

Harcros Chemicals Inc. DATE: 21-DEC-2009
MSDS No. 000066/ Revision No. 07
Page 1

Section I. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CAS #: N/A
FORMULA: Mixture
CHEM. FAMILY: Organic Mixtures

PRODUCT NAME: T-MULZ W

SUPPLIERS NAME: Harcros Chemicals Inc.
5200 Speaker Road
Kansas City, KS 66106-1095

SUPPLIERS PHONE NUMBER: 913-321-3131
TRANSPORTATION EMERGENCY PHONE NUMBER: 1-800-424-9300

Section II. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
LABEL SIGNAL WORD: DANGER!
PRECAUTIONS
Wear protective equipment when handling. Use only with adequate ventilation. Wash thoroughly after handling. Do Not breathe vapor, mist, or dust. Do Not get in eyes, skin, or clothing. Avoid prolonged or repeated contact with skin. Do not swallow.

ROUTE(S) OF ENTRY: Eye Contact, Skin Contact, Inhalation

Potential Health Effects (ACUTE AND CHRONIC):
OVEREXPOSURE MAY AGGRAVATE DISORDERS TO:
Eyes, Skin, Respiratory System.

OVEREXPOSURE MAY CAUSE DAMAGE TO,
DISORDERS OF, OR ADVERSELY AFFECT THE FOLLOWING SYSTEMS, FUNCTIONS, ORGANS:
Liver, Kidneys, Lungs, Fetus, Blood

CARCINOGENICITY: No components, present in excess of 0.1% by weight are listed as carcinogens by IARC, NTP, or OSHA.

PROPOSTION 65:
WARNING: This product *may* contain trace amounts of chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

EYE: Eye contact with product may cause irritation, burns.

SKIN: Skin contact may cause severe irritation.
Prolonged or repeated skin contact may cause defatting, drying, dermatitis, burns. May be absorbed in harmful amounts.

Section II. HAZARDS IDENTIFICATION CONTINUED

INHALATION: Inhalation may cause irritation, coughing, headache, nausea, drowsiness.
Prolonged or repeated overexposure by inhalation may cause central nervous system (CNS), Depression, hearing impairment. Symptoms of early to moderate central nervous system (CNS) depression include giddiness, dizziness, confusion, drunken behavior, headache, nausea, diarrhea, vomiting, tiredness and drowsiness. In extreme cases, symptoms of central nervous system (CNS) depression include stupor, convulsions, unconsciousness, coma, and even death.

INGESTION: Ingestion may cause irritation, central nervous system (CNS) depression, nausea, vomiting, diarrhea, aspiration, pneumonia. Symptoms of early to moderate central nervous system (CNS) depression include giddiness, dizziness, confusion, drunken behavior, headache, nausea, diarrhea, vomiting, tiredness and drowsiness. In extreme cases, symptoms of central nervous system (CNS) depression include stupor, convulsions, unconsciousness, coma, and even death. Aspiration (breathing) of liquid, mist, or vomit into lungs can cause aspiration (chemical) pneumonia, hemorrhaging (bleeding), lung damage, and even death. Symptoms of aspiration pneumonia include coughing, labored breathing and bluish skin.

Section III. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS NUMBER	MAX Percentage%	EXPOSURE LIMITS TWA/TLV ppm	STEL ppm	CEIL ppm	SKIN	AGENT
Naphtha, Light Aromatic Aromatic Hydrocarbons C8-10	64742-95-6	10.00	Industry Recommendation (Exxon) 50 ppm				
Naphtha, Light Aromatic Contains:							
1,2,4-Trimethylbenzene	95-63-6	3.20	25			N	OSHA
Pseudocumene			25			N	ACGIH
n-Butyl Alcohol	71-36-3	10.00			50	Y	OSHA
1-Butanol					50	Y	ACGIH
C(11-13) Branched Alkylbenzene Sulfonic Acid, Calcium Salts	68953-96-8	25.00					

Section IV. FIRST AID MEASURES

EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes, while holding eyelids apart to ensure flushing of entire surface. Call a physician.

SKIN CONTACT:
Immediately flush skin with plenty of water for at least 15 minutes, while removing contaminated clothing and shoes. Thoroughly clean clothing and shoes before reuse. Call a physician.

INHALATION:
Remove to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. If breathing is difficult give oxygen. Call a physician.

Section IV. FIRST AID MEASURES CONTINUED.

INGESTION: DO NOT induce vomiting. Rinse mouth with water. Dilute stomach contents by drinking water. If vomiting occurs spontaneously, keep head below hips to prevent breathing vomit into lungs. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Call a physician immediately.

Section V. FIRE FIGHTING MEASURES

FLASHPOINT (METHOD): > or = 109 deg. F (PMCC)

FLAMMABLE LIMITS: (% Volume in Air) UPPER: N/D LOWER: N/D

EXTINGUISHING MEDIA: Water Fog, dry chemical, foam, carbon dioxide

SPECIAL FIRE FIGHTING PROCEDURES:
Prevent human exposure to fire, fumes, smoke, and products of combustion. Evacuate non-essential personnel. Firefighters should wear full face, self-contained breathing apparatus and impervious protective clothing. A direct stream of water may cause foaming. Do not use a direct stream of water. Use water to cool containers exposed to fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapor may travel a considerable distance to a source of ignition and flash back. Hot organic chemical vapors may spontaneously ignite or explode when mixed with air, even at temperatures below their published autoignition temperature.

FLAMMABILITY AND COMBUSTIBILITY:
This product is flammable or combustible. Flash point is less than 200 degrees F. Keep liquid and vapor away from oxidizers, heat, sparks and flame. No smoking where material is used or stored. Surfaces that are sufficiently hot may ignite even liquid product in the absence of sparks or flame. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapors are gone. Vapors may accumulate and travel to ignition sources distant from the handling site; flash-fire can result. Keep containers closed when not in use.
Use with adequate ventilation. Static electricity may accumulate and create a fire hazard. Ground fixed equipment. Bond and ground transfer containers and equipment. Contact with oxidizers may result in a fire and/or explosion. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Section VI. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Evacuate non-essential personnel, eliminate ignition sources, and wear protective equipment (See Section VIII). Shut off source of leak only if safe to do so. Contain spill. Recover free product. To clean up residue, flush sparingly with water or use an absorbent. Avoid runoff to ground water, surface waters, and sewers. It may be necessary to remove contaminated soil. If product is flammable or combustible, use non-sparking tools. If acidity (low pH) is a problem, neutralize with hydrated lime, soda ash, or sodium bicarbonate. If alkalinity (high pH) is a problem, neutralize with dilute acetic acid or dilute hydrochloric (muriatic) acid. If required, notify state and local authorities. Product may be toxic to fish or aquatic life.

Section VI. ACCIDENTAL RELEASE MEASURES continued.

DISPOSAL METHOD:
Solids must be disposed of in a permitted waste management facility. Recovered liquids may be reprocessed or incinerated. Incineration must be handled in a permitted facility. Dispose of material in accordance with all Federal, State and local regulations. Local regulations may be more stringent than Federal or State. Product may cause foaming problems.

Section VII. HANDLING AND STORAGE

HANDLING
For industrial use only. Keep heat, lights, fire, and sparks away. Drum must be grounded and bonded to receiving container when being emptied. Use spark proof tools when handling.

STORAGE
Keep container closed when not in use. Store in a cool dry place. Store away from oxidizers. Do Not store above 120 deg. F. in aluminum equipment. Keep out of reach of children.

Section VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
Local exhaust is desired in closed places.
Mechanical general ventilation is usually adequate. Local mechanical ventilation may be required.

RESPIRATORY PROTECTION: If exposure limits are exceeded, or if exposure may occur, use a NIOSH/MSHA respirator approved for your conditions of exposure. Refer to the most recent NIOSH publications concerning chemical hazards, or consult your safety equipment supplier. Respiratory protection programs must be in compliance with OSHA requirements in 29 CFR 1910.134. For emergencies, a NIOSH/MSHA approved positive pressure-breathing apparatus should be readily available.

EYE PROTECTION: Chemical goggles. Always wear eye protection when working with chemicals. Do not wear contact lenses when working with chemicals.

SKIN PROTECTION: impervious gloves, clean, protective body covering.

OTHER PROTECTIVE EQUIPMENT:
Safety shower, eye wash fountain, and washing facilities should be readily available.

WORK HYGIENIC PRACTICES: Avoid contact with skin, eyes, and clothing. After handling this product, wash hands before eating, drinking, or smoking. If contact occurs, remove contaminated clothing. If needed, take First Aid action shown in Section IV. Launder contaminated clothing before reuse.

Section IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colored liquid
Odor: Aromatic
pH: aqueous approx. 5.000 to 7.000
Boiling point/boiling range: N/D
Freezing Point: 64 deg, F.

Section IX. PHYSICAL AND CHEMICAL PROPERTIES continued.

Flash Point: 109 deg. F (PMCC)
Vapor Pressure: (MM HG.): N/D
Vapor Density: (Air =1) N/D
Solubility In Water: Dispersible
Specific Gravity:(H2O=1): > or = 1.0400 @ 68 deg. F
Evaporation Rate: (NA =1): N/D
Percent Volatile by Volume: N/D

Section X. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

MATERIALS TO AVOID: Inorganic acids, inorganic bases, bleaching agents (oxidizers). Avoid contact with bleaching agents and oxidizers, which include chlorine, oxygen, permanganates, perchlorates, percarbonates, peroxides, chromates, hypochlorites, nitric acid, and sulfuric acid.

CONDITIONS TO AVOID: Heat, heated surfaces, static electricity, electric arcs, sparks and flames.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Thermal decomposition or combustion (burning) can produce carbon dioxide carbon monoxide oxides of sulfur Miscellaneous organic compounds, some possibly toxic.

HAZARDOUS POLYMERIZATION: Will not occur

Section XI. TOXICOLOGICAL INFORMATION

ANIMAL TEST DATA
Data Not Available.

Section XII. ECOLOGICAL INFORMATION

Data Not Available.

Section XIII. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Solids must be disposed of in a permitted waste management facility. Recovered liquids may be reprocessed or incinerated. Incineration must be handled in a permitted facility. Dispose of material in accordance with all Federal, State and local regulations. Local regulations may be more stringent than Federal or State. Product may cause foaming problems.

Section XIV. TRANSPORT INFORMATION

DOT (Department of Transportation)
Proper Shipping Name: Combustible Liquid, NOS (Butyl Alcohol, Calcium Dodecylbenzene Sulfonate)
Hazard Class: Combustible Liquid
UN/NA Number: UN1993

Section XIV. TRANSPORT INFORMATION continued.

Packaging Group: III
Label Requirements: Combustible Liquid
Reportable Quantity (RQ): None

Section XV. REGULATORY INFORMATION

S.A.R.A.

HAZARDS:	Acute	Fire	Chronic
PHYSICAL DATA :	Mixture	Liquid	

EPCRA APPLIES:

CAS# 64742-95-6	312: Y	313: N
CAS# 95-63-6	312: Y	31Y: Y
CAS# 71-36-3	312: Y	313: Y
CAS# 68953-96-8	312: Y	313: N

TSCA INVENTORY STATUS: Listed
TSCA, 40 CFR 710: Sources of the raw materials used in this mixture assure that all chemical ingredients present are in compliance with Section 8(b) Chemical Substance Inventory, or are otherwise in compliance with TSCA.

INTERNATIONAL INVENTORY STATUS:

Canada (DSL):	Listed
Australia (AICS):	Listed
China (CIS):	Listed
Europe(EINECS/ NLP)	Listed
Japan (MITI):	Not Listed

WHMIS Classification: B3 Combustible Liquid; D2A Embryotoxicity in animals; D2B Irritant.

REACH Classification: Carc.Cat. 2;R45 – Muta. Cat. 2; R46 – Xn; R65 – N;R51-53 – R10 – Xn; R22 Xi; R37/38-41 – R67

R10: Flammable
R22: Harmful if swallowed.
R37/38: Irritating to respiratory system and skin.
R41: Risk of serious damage to eyes.
R45; May cause cancer
R46: May cause heritable genetic damage.
R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R65; Harmful may cause lung damage if swallowed.
R67: Vapors may cause Drowsiness and dizziness.
S2: Keep out of the reach of children.
S7: Keep Container tightly closed.
S9: Keep container in a well-ventilated place.
S13: Keep away from food, drink and animal feedstuffs.

Section XV. REGULATORY INFORMATION Continued

S24: Avoid contact with skin.

S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S37/39: Wear Suitable gloves and eye/face protection.

S45: In case of accident or if you feel unwell, seek medical advice immediately (Show label).

S46: If swallowed, seek medical advice immediately and show this container.

S53: Avoid exposure – obtain special instructions before reuse.

S61: Avoid release to the environment. Refer to special instructions/ Safety Data Sheet.

S62: If swallowed, do not induce vomiting: seek medical advice immediately and show container or label.

Section XVI. OTHER INFORMATION

HMIS HEALTH:	2	DATE ISSUED: 920323
FLAMMABILITY:	2	DATE REVISED: 091221
REACTIVITY:	0	SECTIONS: REACH & WHMIS
PERSONAL PROTECTION:	X	

N/A = NOT APPLICABLE
N/D = NOT DETERMINED
N/E = NOT ESTABLISHED

The information provided in this Material Safety data sheet has been obtained from sources believed to be reliable. Harcros Chemicals Inc provides no warranties, either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. This information is offered for your information, consideration, and investigation. You should satisfy yourself that you have all current data relevant to your particular use. Harcros Chemicals Inc knows of no medical condition, other than those noted on this material safety data sheet, which are generally recognized as being aggravated by exposure to this product.

Section XVI. OTHER INFORMATION Continued.

MATERIAL SAFETY DATA SHEET

POTASSIUM PERMANGANATE
(Pro-Pot Perm)

PRO PRODUCTS, LLC
502 Incentive Drive
Fort Wayne, IN 46825
1-800-285-9176

HMIS INFORMATION
Health: 1
Flammability: 0
Reactivity: 0
Special Hazard: Oxidizer

In case of emergency call: CHEMTREC 1-800-424-9300

SECTION 1: PRODUCT INFORMATION

TRADE NAME: Potassium Permanganate
DESCRIPTION: Salt Crystal

SECTION 2: HAZARDOUS INGREDIENTS

	CAS #	PEL	TLV
Potassium Permanganate	7722-64-7	N/A	N/A*

*Manufacturer recommends a Ceiling exposure limit of 5 mg/m3

SECTION 3: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, COLOR, ODOR: Dark purple solid with a metallic luster, odorless
BOILING POINT: NA
VAPOR PRESSURE: NA
VAPOR DENSITY: NA
EVAPORATION RATE: NA
SOLUBILITY IN WATER: 6.0% at 20^{0}C
SP. GRAVITY (WATER = 1): 2.7
20.0% at 65^{0}C
PERCENT VOLATILE: NONE
ND=NO DATA NA=NOT APPLICABLE

SECTION 4: FIRE AND EXPLOSION HAZARD

FLASH POINT AND METHOD USED: NONE
EXTINGUISHING MEDIA: Use large quantities of water. Watch for rapid burning and be prepared to retreat to a safe distance. In presence of white, yellow, or brown fumes, wear a positive pressure SCBA and full protective clothing.
EXPLOSION HAZARD: Powerful oxidizer. May decompose spontaneously if exposed to intense heat (150^{0}C/302^{0}F). May be explosive in contact with some other chemicals. May react violently with finely divided and readily oxidizable substance. Increases flammability of combustible materials.

SECTION 5: CHEMICAL REACTIVITY

REACTIVITY: Stable under normal conditions.
CONDITIONS TO AVOID: Contact with incompatible materials or heat (>150^{0}C/302^{0}F).
CHEMICAL INCOMPATIBILITIES: Contact with acids, peroxides, and all combustible organic or readily oxidizable materials including inorganic oxidizable materials and metal powders. With hydrochloric acid, chlorine gas is liberated. Do not mix with formaldehyde.
HAZARDOUS DECOMPOSITION: Thermal decomposition products include corrosive fumes or smoke.
HAZARDOUS POLYMERIZATION: Will not occur

POTASSIUM PERMANGANATE
(Pro-Pot Perm)

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SECTION 6: CHRONIC TOXICITY

CARCINOGEN STATUS: No reports of carcinogenicity found in NTP, IARC or OSHA lists.
INHALATION: Manganese oxides may produce lung irritation and central nervous system disorder. Symptoms may simulate Parkinson's disease.
SKIN CONTACT: None
INGESTION: None
MEDICAL CONDITIONS EXACERBATED BY OVEREXPOSURE: May cause further irritation of tissue or open wounds, burns and mucous membranes.

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SECTION 7: ACUTE HEALTH HAZARDS

INHALATION: Irritation of the upper respiratory tract
SKIN: Irritating or corrosive to body tissue upon contact, leaving brown stains on the skin.
INGESTION: May cause severe burns to mucous membranes of the mouth, throat, esophagus, and stomach.
MEDICAL CONDITIONS EXACERBATED BY OVEREXPOSURE: May cause further irritation of tissue or open wounds, burns and mucous membranes.

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SECTION 8: FIRST AID

EYE AND SKIN CONTACT: Irrigate affected area with copius amounts of water for at least 15 minutes. Do not attempt to chemically neutralize. Seek medical attention immediately.
INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.
INGESTION (SWALLOWING): *DO NOT INDUCE VOMITING*. If conscious, give large quantities of water. Call a physician or local poison control center.

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SECTION 9: HANDLING AND STORAGE

SAFE STORAGE: Protect containers against physical damage. Store in a cool, dry area in closed containers. Segregate from acids, peroxides, and all combustible, organic, or easily oxidizable materials.
SAFE DISPOSAL: Reduce material in aqueous solution with sodium thiosulfate (Hypo), a bisulfite, or ferrous salt solution. The bisulfite or ferrous salt may require some dilute sulfuric acid to promote rapid reduction. Neutralize with sodium bicarbonate to neutral pH if acid is used. Decant or filter and mix formed sludge with sodium carbonate and deposit in an approved landfill. Where permitted, the sludge can be flushed into sewer with large quantities of water. Follow all federal, state, and local regulations.
IN CASE OF SPILL: Contain and Neutralize

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SECTION 10: CONTROL MEASURES

PROTECTIVE EQUIPMENT: Gloves – Use rubber or plastic; Eyes – face shield and/or goggles; Respirator – use NIOSH approved dust and mist respirator; Other – normal clothing, covering arms and legs and rubber apron. All PPE must be selected and used in accordance with Subpart I of the OSHA General Industry Standards.
VENTILATION: Provide local exhaust or process enclosure ventilation.

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Purdue University Environmental Management and Education Program.
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